HEADPHONE by SRS

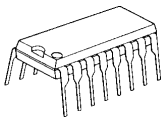
SRS HEADPHONE 3D SURROUND PROCESSOR

■GENERAL DESCRIPTION

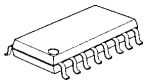
The **NJM2190** is a headphone surround processor based on SRS technology. It provides a realistic and spacious listening experience through standard headphones.

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

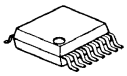
■PACKAGE OUTLINE



NJM2190D



NJM2190M

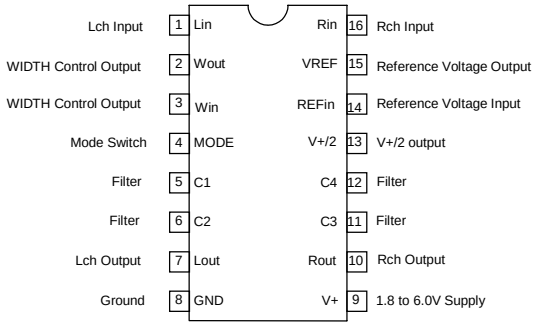


NJM2190V

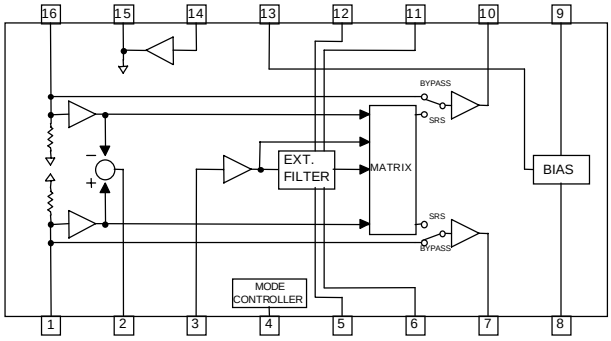
■FEATURES

- ●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	INPUT L	INPUT R	OUTPUT	MODE	WIDTH VR(*1)	MIN	TYP	MAX	UNIT
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(50mVrms),Ta=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	CONDITION						MIN	TYP	MAX	UNIT
			INPUT L	INPUT R	OUTPUT	MODE	WIDTH VR(*1)				
Maximum Input Voltage(*2)	V_{IN}	V^+=1.8V f=1kHz THD=1%	V_{IN}	V_{IN}	L	SRS	MIN	-	-16.7 (146)	-	dBV (mVrms)
					R						
		V^+=1.8V f=1kHz THD=1%	V_{IN}	V_{IN}	L	SRS	MAX	-	-16.7 (146)	-	
					R						
		V^+=1.8V f=100Hz THD=1%	V_{IN}	-V_{IN}	L	SRS	MIN	-	-22.9 (72)	-	
					R						
		V^+=1.8V f=100Hz THD=1%	V_{IN}	-V_{IN}	L	SRS	MAX	-28.5 (38)	-26.5 (47)	-	
					R						
Output Noise	V_{NO}	Rg=0Ω A-Weighted	0	0	L	BYPASS	-	-	-110 (3.0)	-104 (6.0)	dBV (μVrms)
					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	-	%
			0	V_{IN}	R						
			V_{IN}	0	L	SRS	MIN	-	0.10	-	
			0	V_{IN}	R						
			V_{IN}	0	L	SRS	MAX	-	0.25	0.5	
			0	V_{IN}	R						
BYPASS Gain	G_{VBYP}	f=1kHz	V_{IN}	0	L	BYPASS	-	-1.0	0.0	1.0	dB
			0	V_{IN}	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						

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

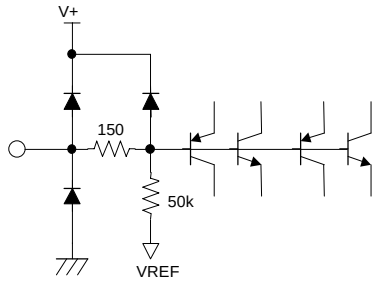
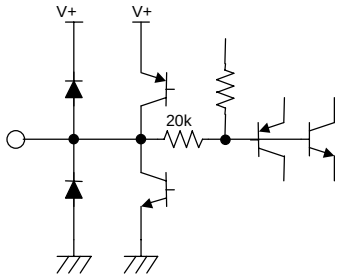
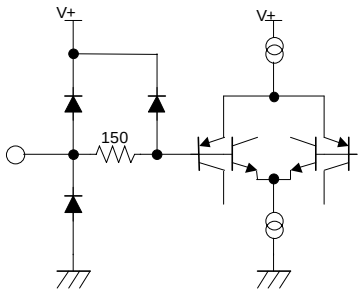
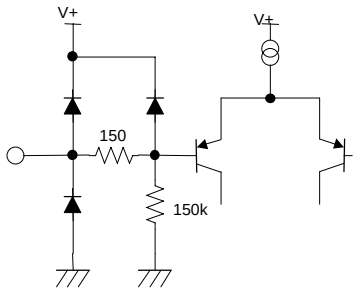
PARAMETER	SYMBOL	CONDITION						MIN	TYP	MAX	UNIT
			INPUT L	INPUT R	OUTPUT	MODE	WIDTH VR(*1)				
L-R Gain (*2)	GL-R	f=100Hz	V_{IN}	-V_{IN}	L	SRS	MIN	3.7	5.7	7.7	dB
					R						
			V_{IN}	-V_{IN}	L	SRS	MAX	19.3	21.3	23.3	
					R						
Channel Separation	CS	f=1kHz	0	V_{IN}	L	BYPASS	-	60.0	80.0	-	dB
			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}'.

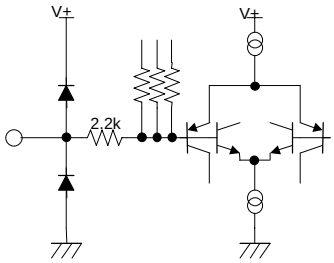
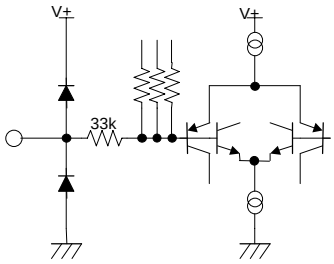
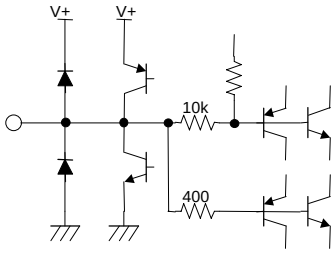
■**MODE Switch**

	MODE
BYPASS MODE	L
SRS MODE	H

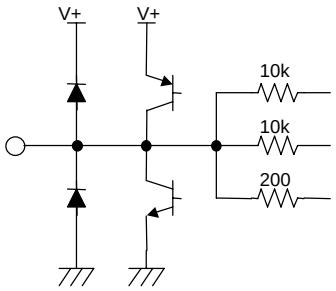
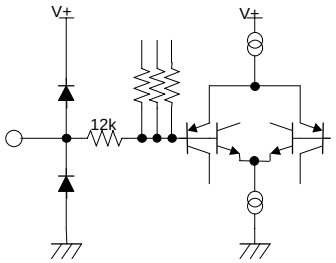
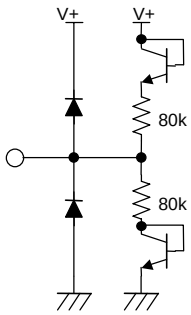
■**TERMINAL DESCRIPTION**

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		-

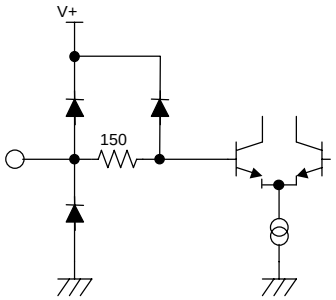
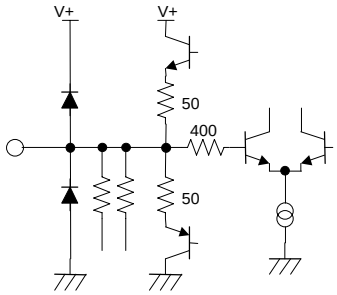
■**TERMINAL DESCRIPTION**

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

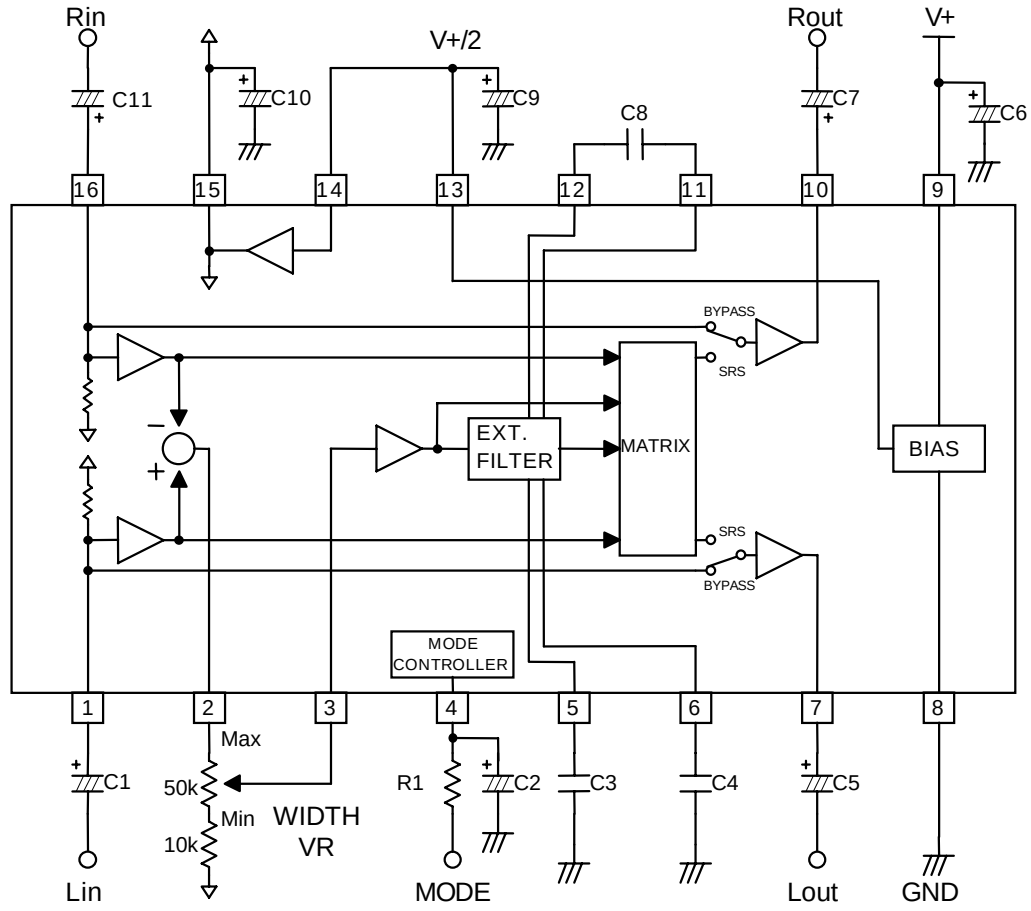
■**TERMINAL DESCRIPTION**

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

■**TERMINAL DESCRIPTION**

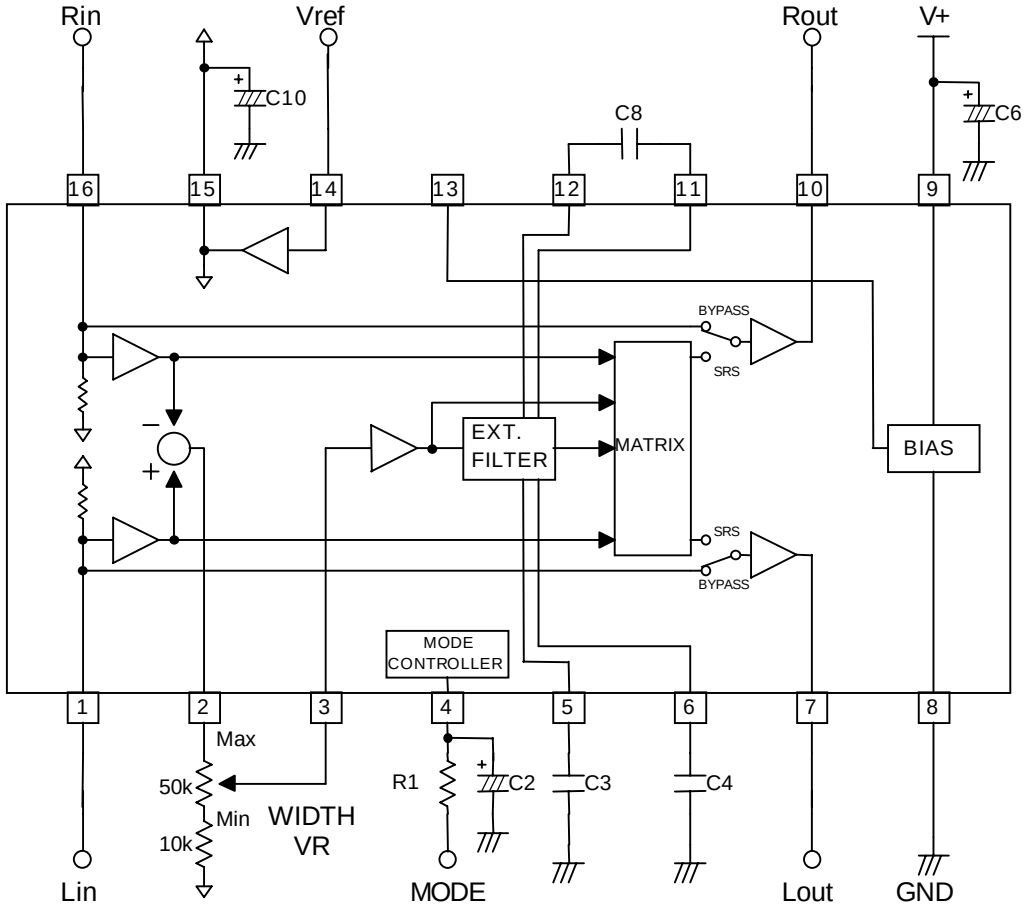
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
14	REFin	Reference Voltage Input		V+/2
15	VREF	Reference Voltage Output		V+/2

■APPLICATION CIRCUIT 1



Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1	22kΩ	5%	C6	22 to 100µF	-
C1	10µF	20%	C7	10µF	20%
C2	10µF	20%	C8	4.7nF	5%
C3	3.3nF	5%	C9	1 to 10µF	-
C4	0.1µF	5%	C10	10 to 7µF	-
C5	10µF	20%	C11	10µF	20%

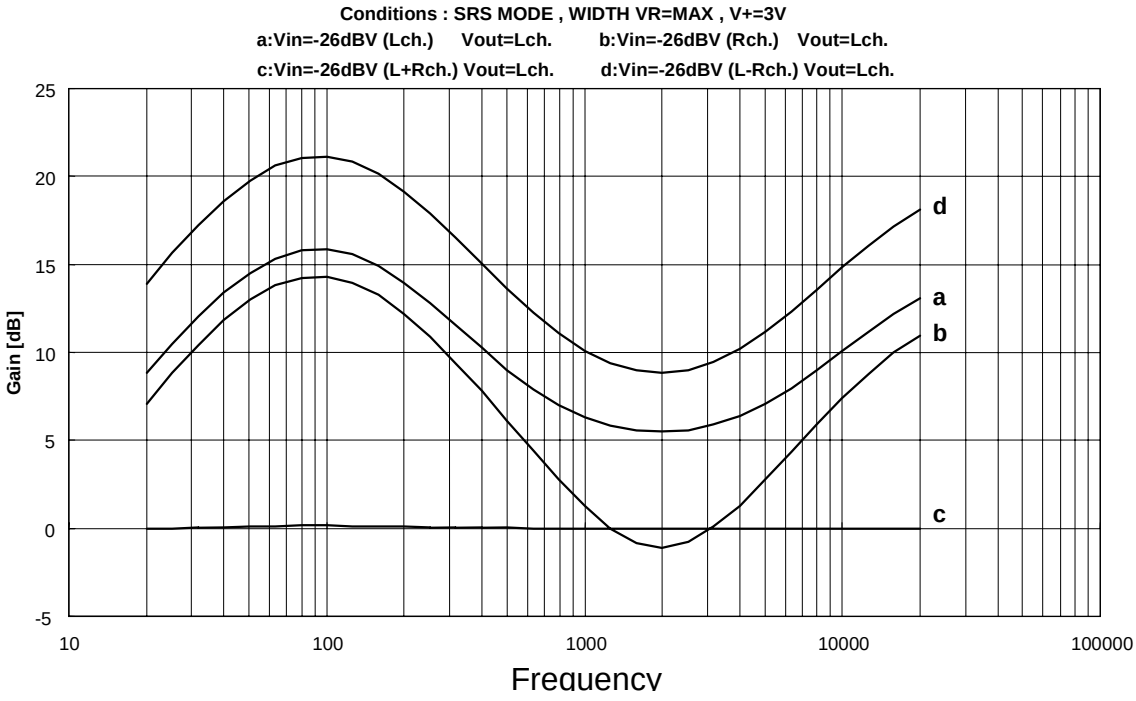
■APPLICATION CIRCUIT 2 (Without using internal V+/2.)



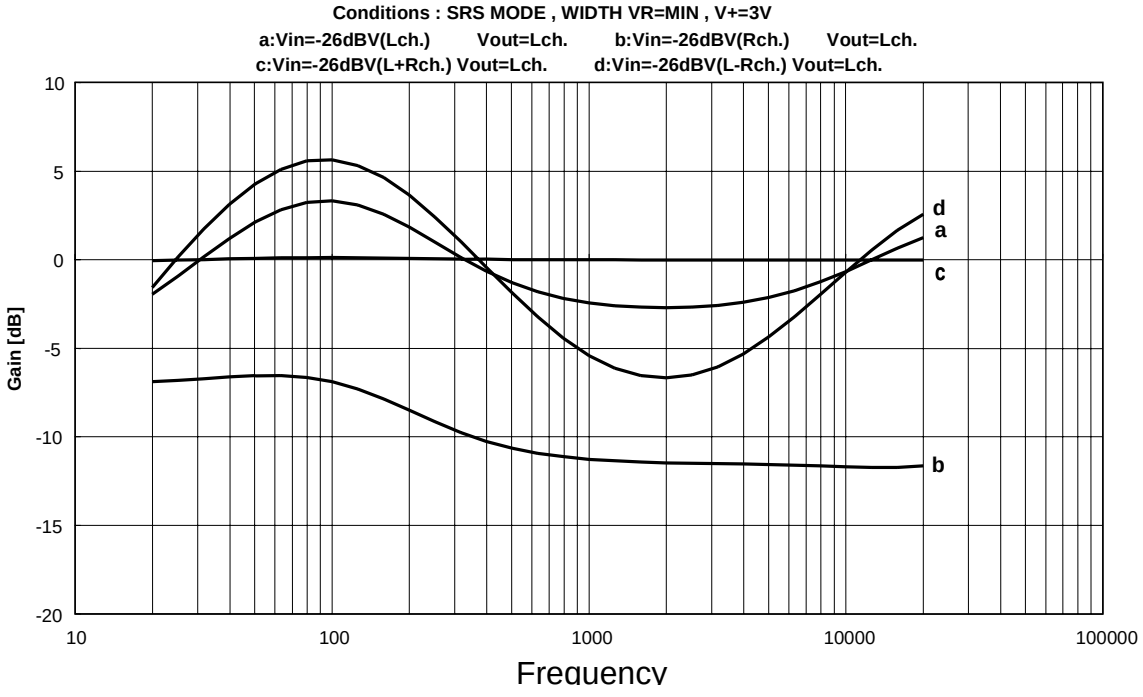
Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1	22kΩ	5%	C6	22 to 100µF	-
C2	10µF	20%	C8	4.7nF	5%
C3	3.3nF	5%	C10	10 to 47µF	-
C4	0.1µF	5%			

■TYPICAL CHARACTERISTICS

GAIN STURUCTURE(WIDTH VR:MAX)

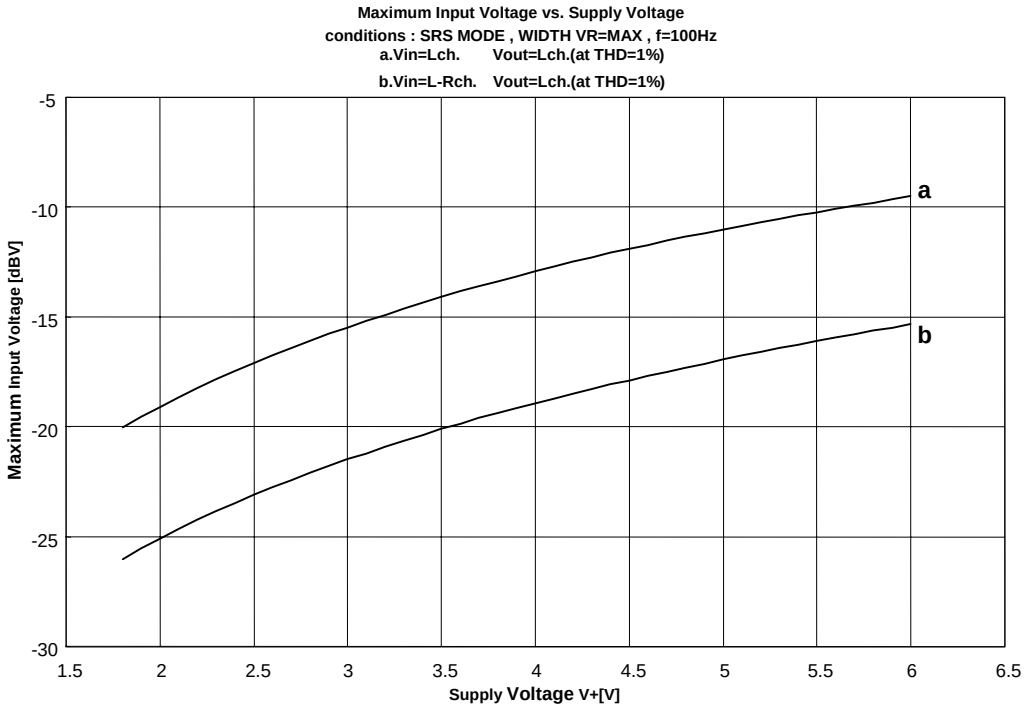


GAIN STRUCTURE(WIDTH VR:MIN)



■TYPICAL CHARACTERISTICS

Maximum Input Voltage vs. Supply Voltage



Maximum Input Voltage vs. WIDTH VR