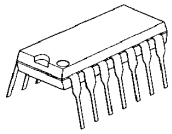
3D SURROUND AUDIO PROCESSOR

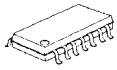
■ GENERAL DESCRIPTION

The **NJM2701** is a 3D surround audio processor regenerating the 3D surround sound with only two speakers.

The **NJM2701** is suitable for audio applications, which are speaker system for mini components, CD radio cassette, multimedia speaker systems, TV and others.

■PACKAGE OUTLINE



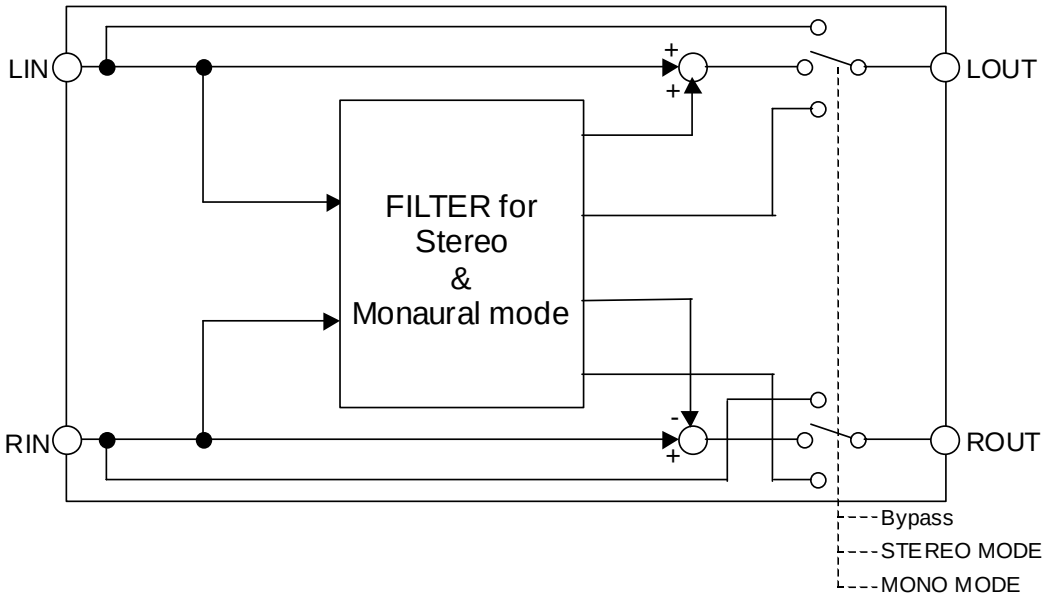


NJM2701D **NJM2701M**

■ FEATURES

- ● Operating Voltage 4.7 to 13V
- ● Stereo mode
  - • Stable center image and Natural sound field
  - • High quality Surround
  - • Free speaker interval
- ● Monaural mode (Mono-to-Stereo Synthesis)
- ● Surround control (Stereo mode only)
- ● Internal Mode Control Switch
- ● Bipolar Technology
- ● Package Outline DIP14, DMP14

■ BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	14	V
Power Dissipation	P_D	(DIP14) 500 (DMP14) 350	mW
Operating Temperature Range	T_{opr}	-40 to +85	°C
Storage Temperature Range	T_{stg}	-40 to +125	°C

■ OPERATING VOLTAGE

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V+	-	4.7	12.0	13.0	V

■ELECTRICAL CHARACTERISTICS (V+=12V,Ta=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION						MIN.	TYP.	MAX.	UNIT
			INPUT		OUTPUT	MODE	VR				
			L	R							
Operating Current	I_{CC}	No Signal	0	0	-	BYPASS	-	2.9	5.7	8.6	mA
			0	0	-	Stereo	MAX	2.9	5.8	8.7	
			0	0	-	Mono	-	3.0	5.9	8.9	

●AC CHARACTERISTICS

(V+=12V,Ta=25°C, V_{IN}=-10dBV(316mVrms), f=1kHz,RL=4.7kΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION						MIN.	TYP.	MAX.	UNIT
			INPUT		OUTPUT	MODE	VR				
			L	R							
Maximum Input Voltage	V_{IM}	f=1kHz T.H.D.=3%	V_{IN} 0	0 V_{IN}	L R	BYPASS	-	9.9 (3.1)	11.9 (3.9)	-	dBV (Vrms)
		f=100Hz T.H.D.=3%	V_{IN} 0	0 V_{IN}	L R	Stereo	MAX	-3.8 (0.6)	-1.8 (0.8)	-	
		f=1kHz T.H.D.=3%	V_{IN} V_{IN}	0 0	L R	Mono	-	6.9 (2.2)	8.9 (2.8)	-	
Output Noise	V_{NO}	Rg=0Ω A-Weighted	0	0	L R	BYPASS	-	-	-112 (2.5)	-106 (5.0)	dBV (μVrms)
		Rg=0Ω A-Weighted	0	0	L R	Stereo	MAX	-	-100 (10)	-94 (20)	
		Rg=0Ω A-Weighted	0	0	L R	Mono	-	-	-103 (7.1)	-97 (14.1)	

●AC CHARACTERISTICS

(V+=12V,Ta=25°C, V_{IN}=-10dBV(316mVrms), f=1kHz,RL=4.7kΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	INPUT L	INPUT R	OUTPUT	MODE	VR	MIN.	TYP.	MAX.	UNIT
Total Harmonic Distortion	T.H.D	f=1kHz	V_{IN} 0	0 V_{IN}	L R	BYPASS	-	-	0.005	0.01	%
		f=1kHz Vin=-20dBV	V_{IN} 0	0 V_{IN}	L R	Stereo	MAX	-	0.1	0.5	
		f=1kHz	V_{IN} V_{IN}	0 0	L R	Mono	-	-	0.1	0.5	
Bypass Gain	G_{VBYP}	f=1kHz	V_{IN} 0	0 V_{IN}	L R	BYPASS	-	-1.0	0.0	1.0	dB
Surround Gain	G_{VSUR}	f=100Hz Vin=-20dBV	V_{IN} 0	0 V_{IN}	L R	Stereo	MAX	10.7	12.7	14.7	dB
		f=100Hz Vin=-20dBV	0 V_{IN}	V_{IN} 0	L R	Stereo	MAX	8.4	10.4	12.4	
		f=100Hz Vin=-20dBV	V_{IN} 0	0 V_{IN}	L R	Stereo	MIN	3.6	5.6	7.6	
		f=1kHz	V_{IN} V_{IN}	0 0	L R	Mono	-	1.0	3.0	5.0	

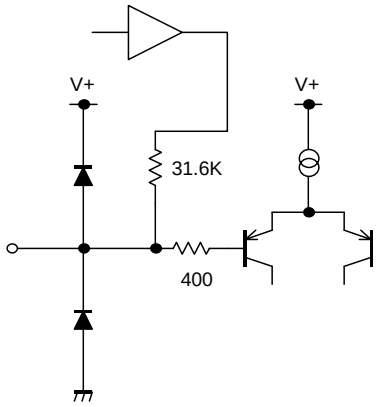
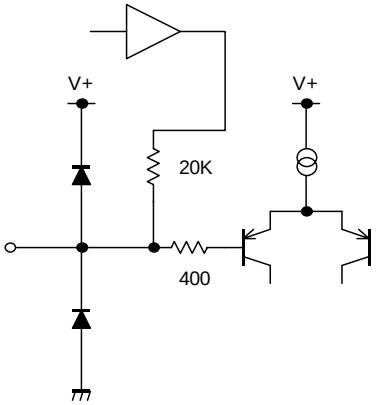
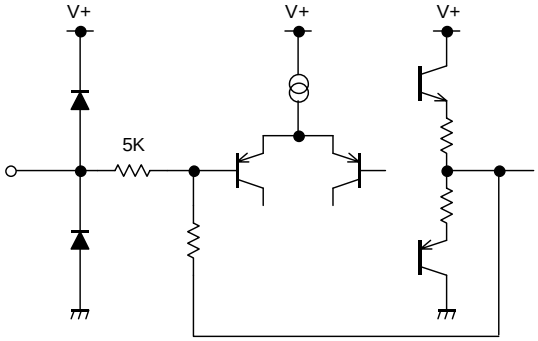
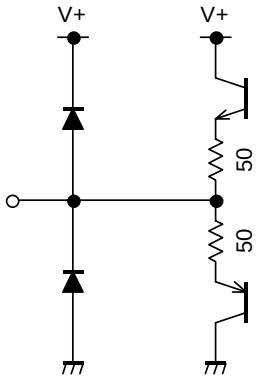
● CONTROL CHARACTERISTICS (V+=12V,Ta=25°C unless otherwise specified)

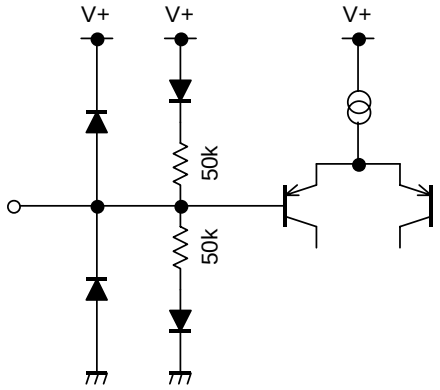
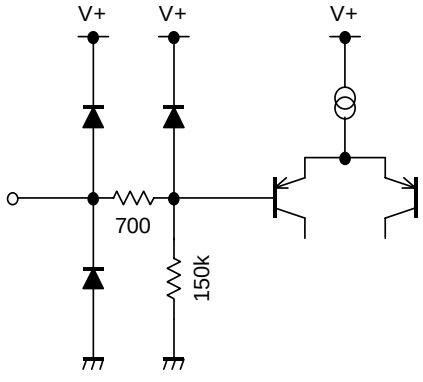
PARAMETER	SYMBOL	TEST CONDITION	INPUT L	INPUT R	OUTPUT	MODE	VR	MIN.	TYP.	MAX.	UNIT
Mode Select Control Voltage	V_{MODE}	V_{IN}= High Level	-	-	-	-	-	2.0	-	V+	V
		V_{IN}= Low Level	-	-	-	-	-	0.0	-	0.7	

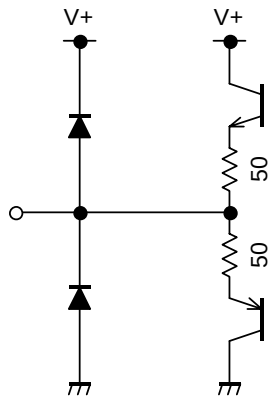
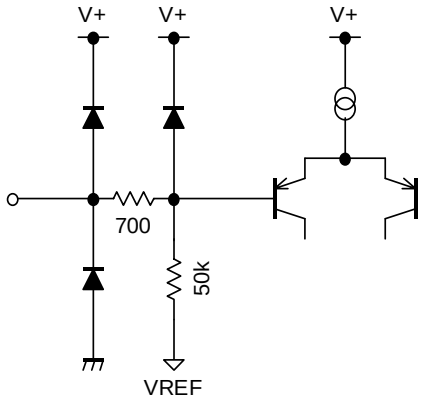
■MODE SWITCH

MODE	SW1	SW2	NOTES
BYPASS	L	-	Input Through
Stereo	H	L	Surround Mode (Stereo Input)
Mono	H	H	Surround Mode (Mono Input)

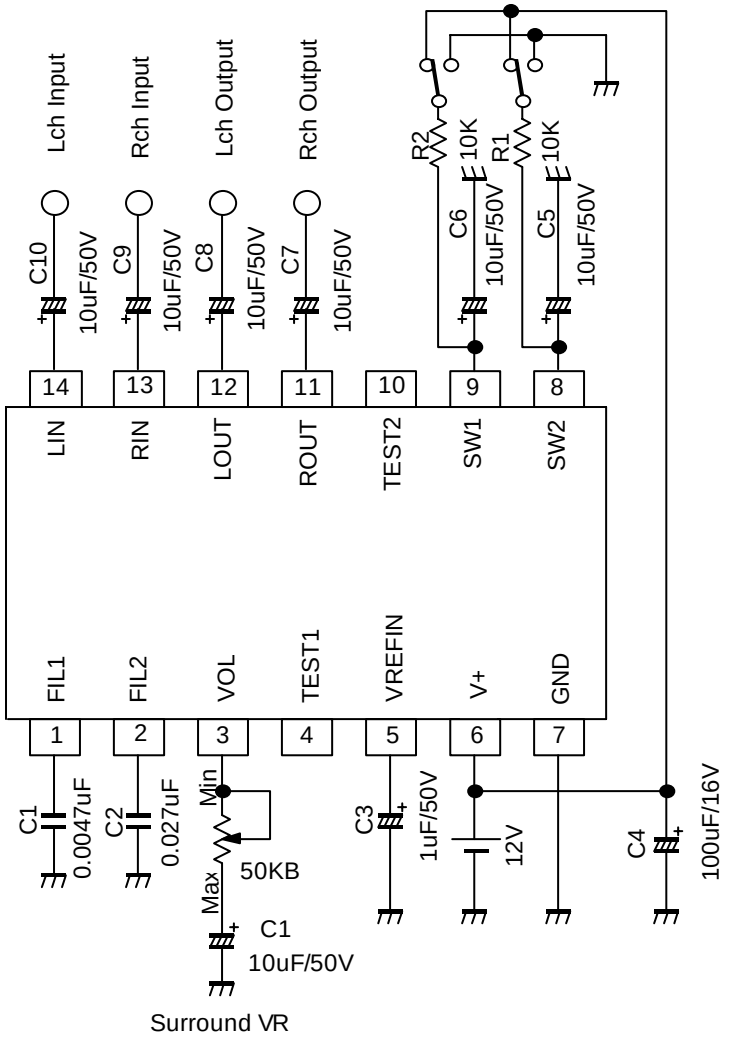
■TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1	FIL1	Filter Input		V+/2
2	FIL2	Filter Input		V+/2
3	VOL	Surround VR		V+/2
4 10	TEST1 TEST2	Test pin		V+/2

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
5	VREFIN	Reference Voltage Input		V+/2
6	V+	Power Supply		V+
7	GND	GND		0V
8 9	SW2 SW1	Mode Control Switch		0V

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
11 12	ROUT LOUT	Rch Output Lch Output		V+/2
13 14	RIN LIN	Rch Input Lch Input		V+/2

■APPLICATION CIRCUIT



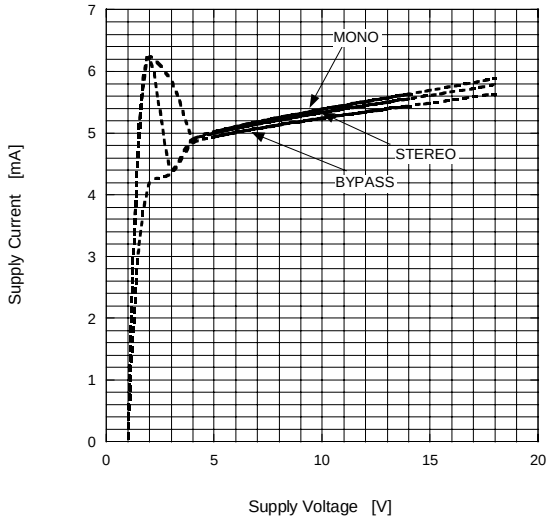
Note) In case of monaural mode (mono to stereo synthesis), input monaural signal into left channel input terminal (LIN).

Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1,R2	10kΩ	5%	C3	1μF	20%
C1	0.0047μF	5%	C4	100μF	20%
C2	0.027μF	5%	C5,C6,C7,C8,C9,C10,C11	10μF	20%

■TYPICAL CHARACTERISTICS

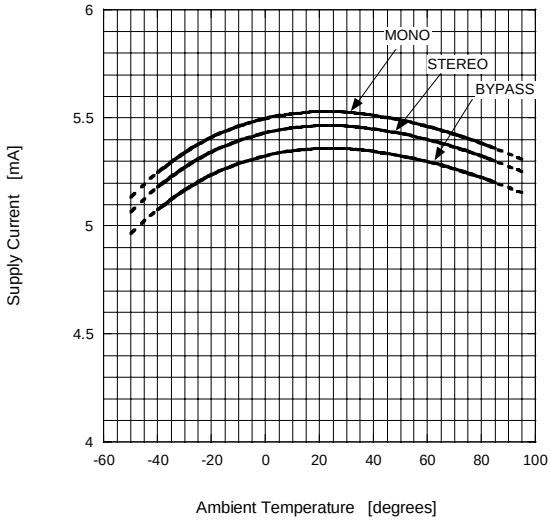
Supply Current vs SupplyVoltage

V+=1 to 18V Ta=25degrees



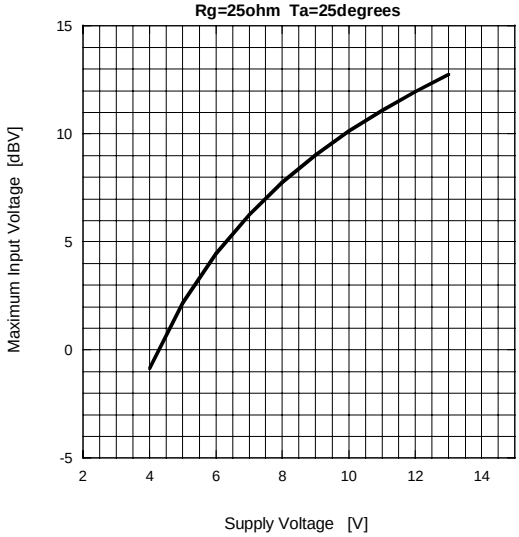
Supply Current vs Ambient Temperature

V+=12V



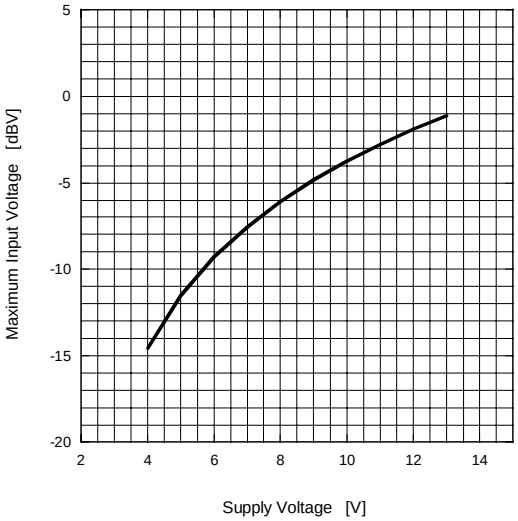
Maximum Input Voltage vs Supply Voltage (BYPASS)

Vin=Lch Vout=Lch f=1KHz RL=47Kohm
Rg=25ohm Ta=25degrees



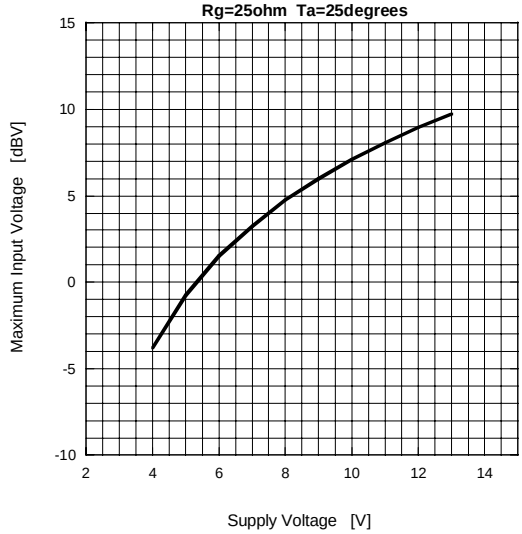
Maximum Input Voltage vs Supply Voltage (STEREO)

Vin=Lch Vout=Lch f=1KHz RL=47Kohm
Rg=25ohm Ta=25degrees



Maximum Input Voltage vs Supply Voltage (MONO)

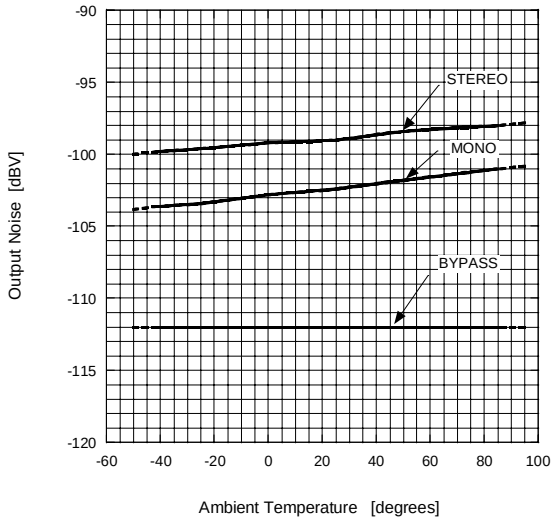
Vin=Lch Vout=Lch f=1KHz RL=47Kohm
Rg=25ohm Ta=25degrees



■TYPICAL CHARACTERISTICS

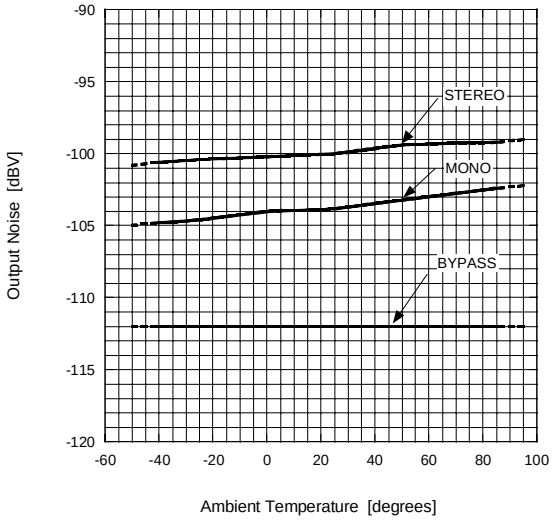
Output Noise vs Ambient Temperature

V+=12V Vin=GND Vout=Lch



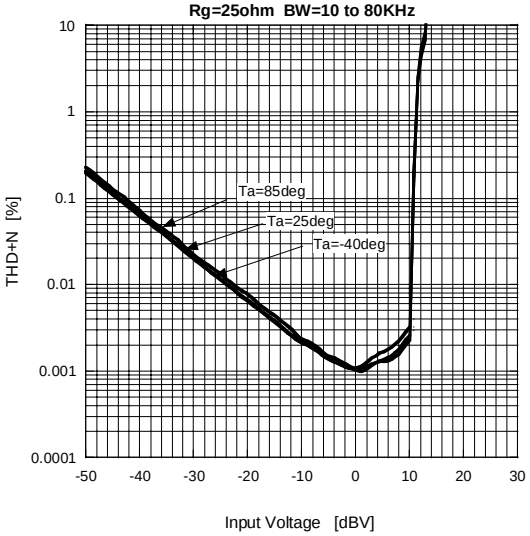
Output Noise vs Ambient Temperature

V+=12V Vin=GND Vout=Rch



Total Harmonic Distortion vs Input Voltage (BYPASS)

V+=12V f=100Hz RL=47Kohm
Rg=25ohm BW=10 to 80KHz



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V+=12V f=1KHz RL=47Kohm
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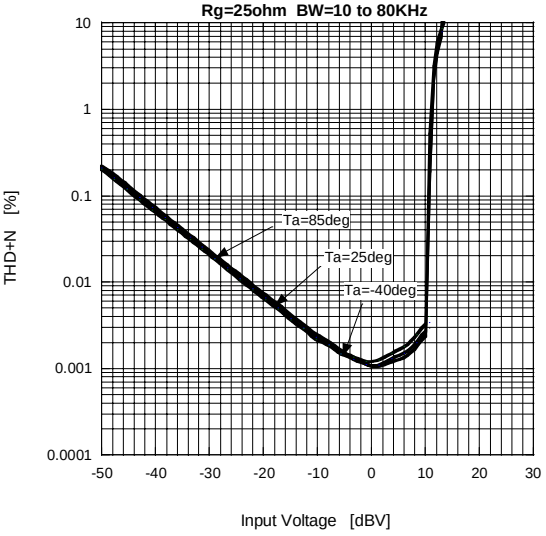
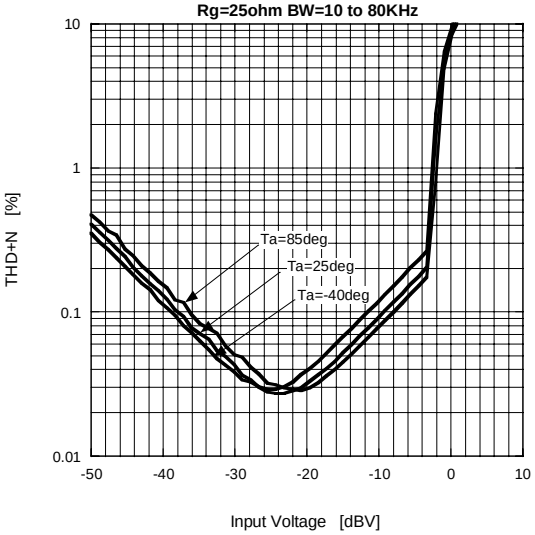


Total Harmonic Distortion vs Input Voltage (STEREO)

V+=12V f=100Hz RL=47Kohm
Rg=25ohm BW=10 to 80KHz



Total Harmonic Distortion vs Input Voltage (STEREO)

V+=12V f=1KHz RL=47Kohm
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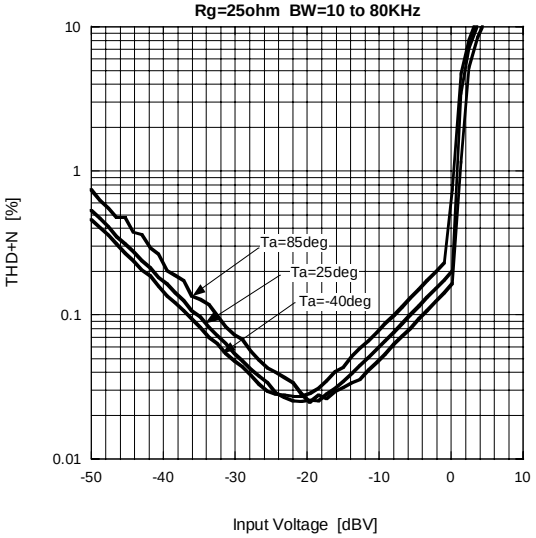

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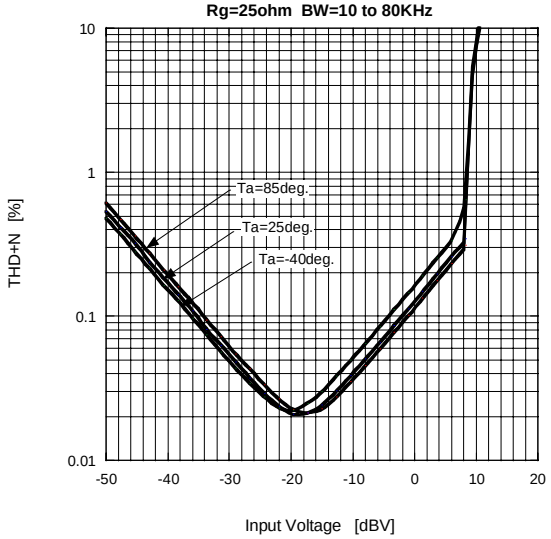
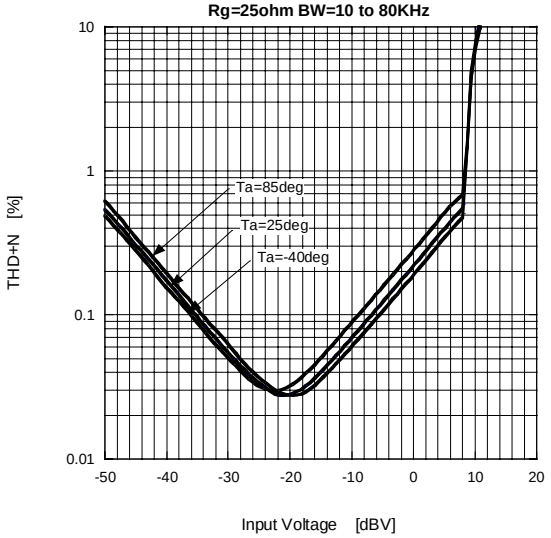
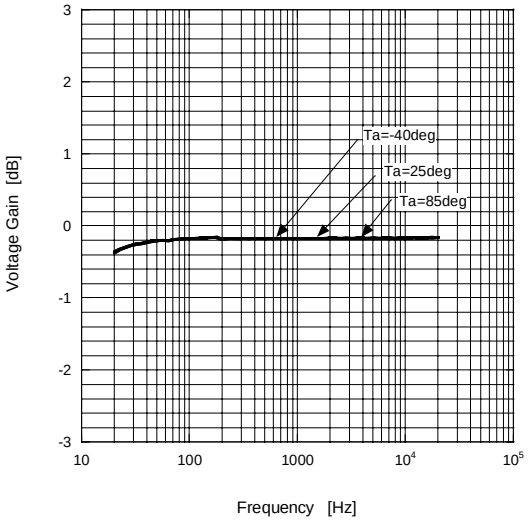
Total Harmonic Distortion vs Input Voltage (MONO)
V+=12V f=100Hz RL=47Kohm Rg=25ohm BW=10 to 80KHz



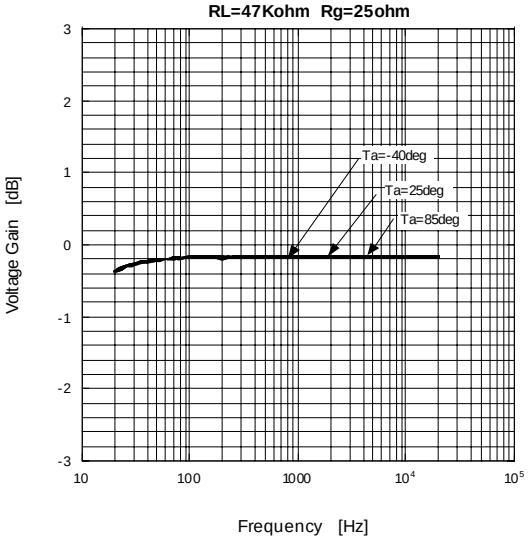
Total Harmonic Distortion vs Input Voltage (MONO)
V+=12V f=1KHz RL=47Kohm Rg=25ohm BW=10 to 80KHz



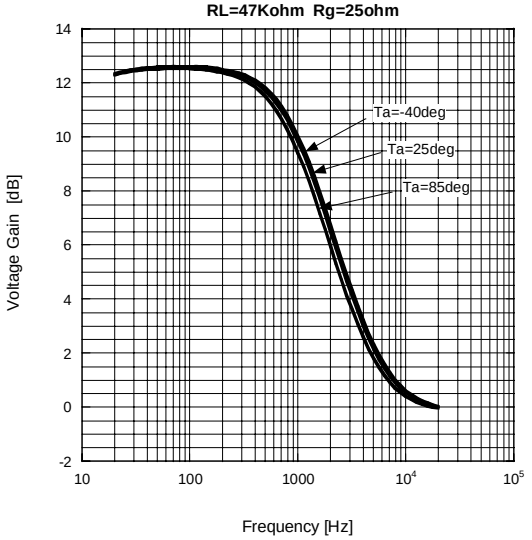
Voltage Gain vs Frequency Response (BYPASS)
V+=12V Vin=-10dBV Lch Vout=Lch RL=47Kohm Rg=25ohm



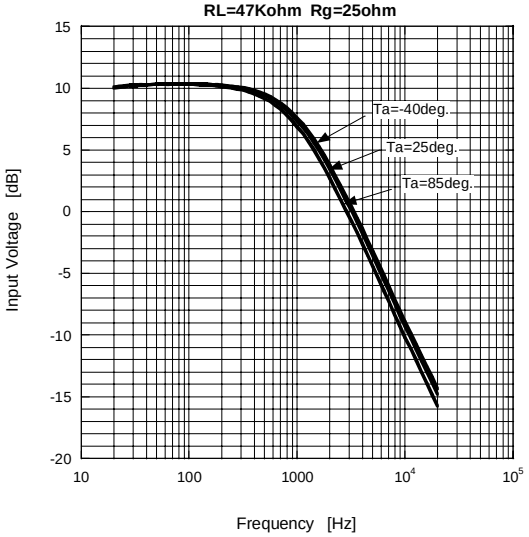
Voltage Gain vs Frequency Response (BYPASS)
V+=12V Vin=-10dBV Rch Vout=Rch RL=47Kohm Rg=25ohm



Voltage Gain vs Frequency Response (STEREO)
V+=12V Vin=-20dBV Lch Vout=Lch RL=47Kohm Rg=25ohm



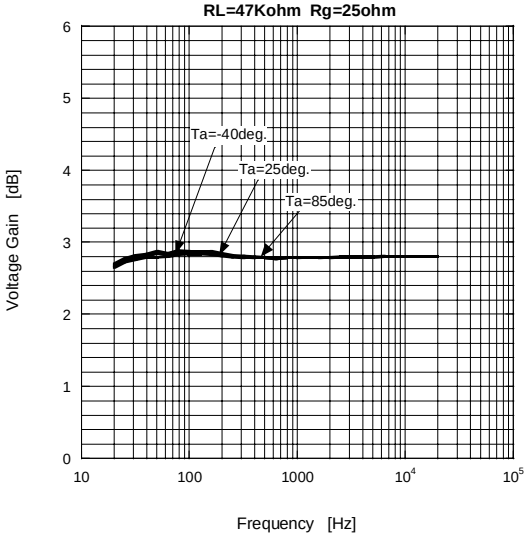
Voltage Gain vs Frequency Response (STEREO)
V+=12V Vin=-20dBV Lch Vout=Rch RL=47Kohm Rg=25ohm



■TYPICAL CHARACTERISTICS

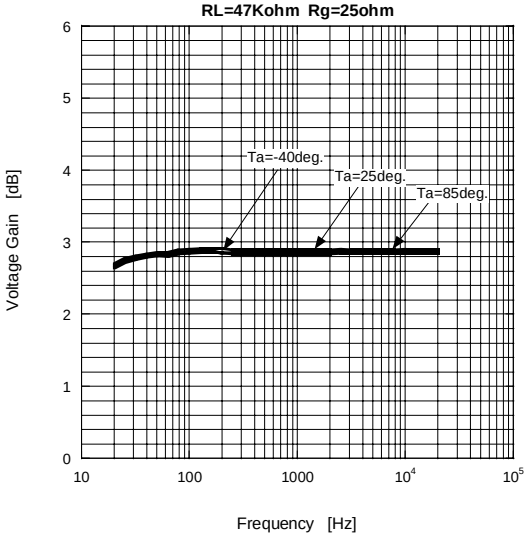
Voltage Gain vs Frequency Response (MONO)

V+=12V Vin=-10dBV Lch Vout=Lch
RL=47Kohm Rg=25ohm



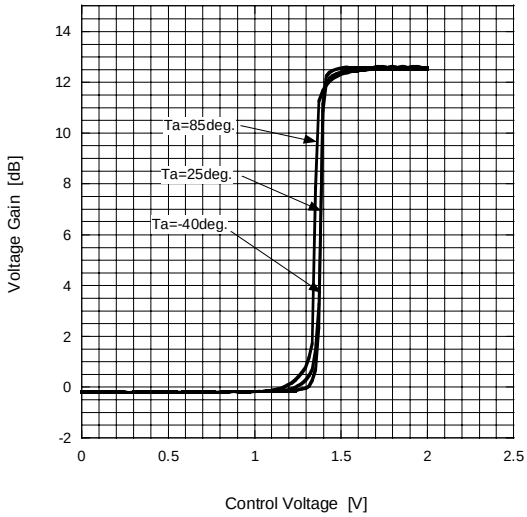
Voltage Gain vs Frequency Response (MONO)

V+=12V Vin=-10dBV Lch Vout=Rch
RL=47Kohm Rg=25ohm



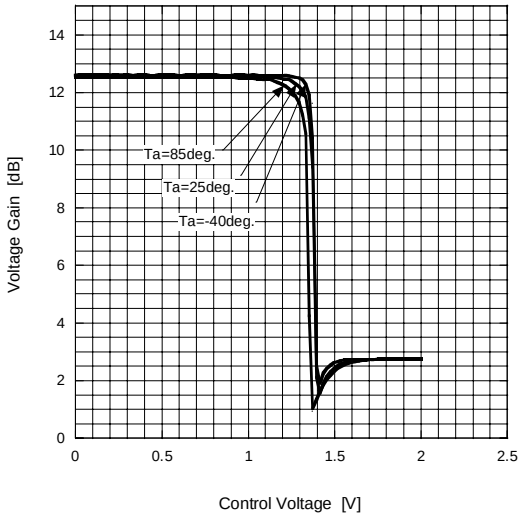
Voltage Gain vs SW1 Control Voltage

V+=12V Vin=-10dBV Lch f=100Hz Vout=Lch
BYPASS --> STEREO



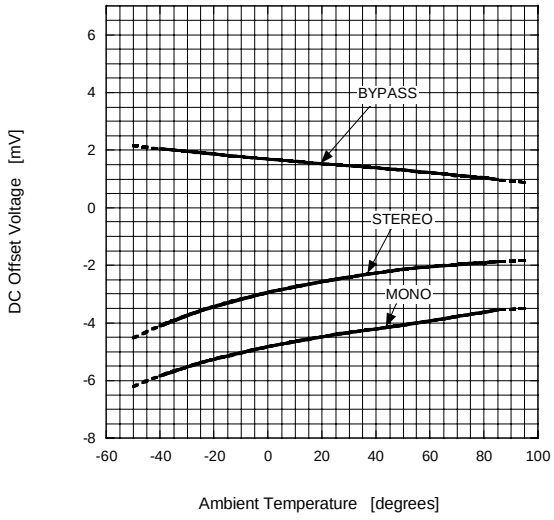
Voltage Gain vs SW2 Control Voltage

V+=12V Vin=-10dBV Lch f=100Hz Vout=Lch
STEREO --> MONO



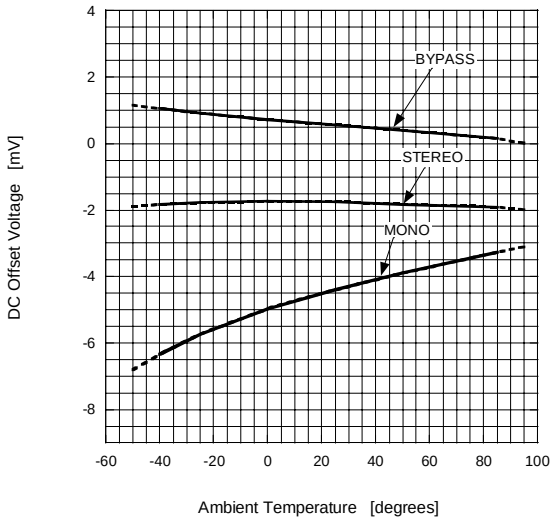
DC Offset Voltage vs Ambient Temperature

V+=12V Vout=Lch



DC Offset Voltage vs Ambient Temperature

V+=12V Vout=Rch



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