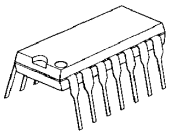
3D SURROUND AUDIO PROCESSOR

■ GENERAL DESCRIPTION

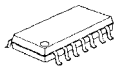
The **NJM2702** is a 3D surround audio processor regenerating the 3D surround sound with only two speakers.

The **NJM2702** is suitable for audio applications, which are speaker system for mini components, CD radio cassette, multimedia speaker systems, TV and others.

■ PACKAGE OUTLINE



NJM2702D



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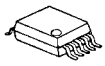
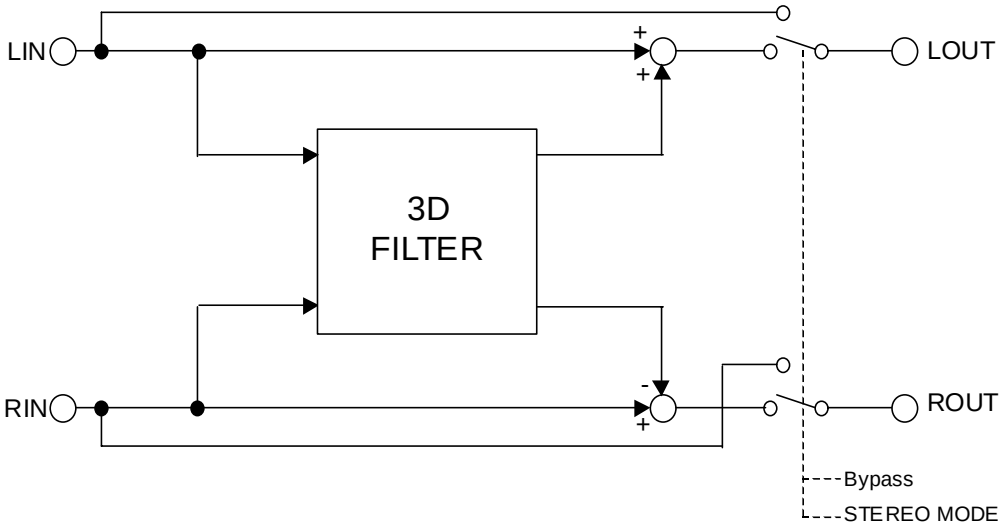


NJM2702V

■ FEATURES

- ● Operating Voltage (4.7 to 13V)
- ● Stereo mode
  - • Stable center image with natural sound field
  - • High quality Surround
  - • Free speaker interval
- ● Surround control
- ● Internal Mode Control Switch
- ● Bipolar Technology
- ● Package Outline DIP14, DMP14, SSOP10

■ 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 (SSOP10) 250	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	-	3.0	6.0	9.0	mA
			0	0	-	Stereo	MAX	3.0	6.0	9.0	

●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)	-	
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)	
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	
Bypass Gain	G_{VBYP}	f=1kHz	V_{IN} 0	0 V_{IN}	L R	BYPASS	-	-1.0	0.0	1.0	dB

●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
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	

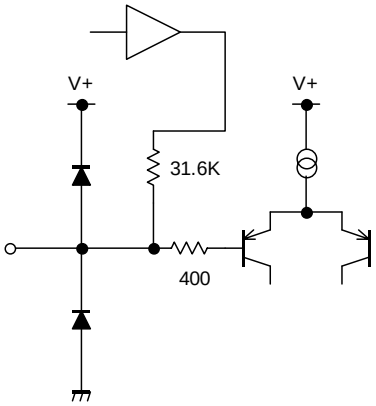
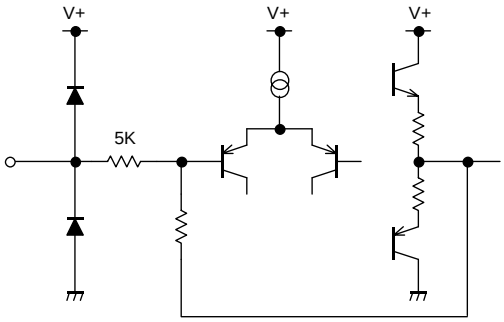
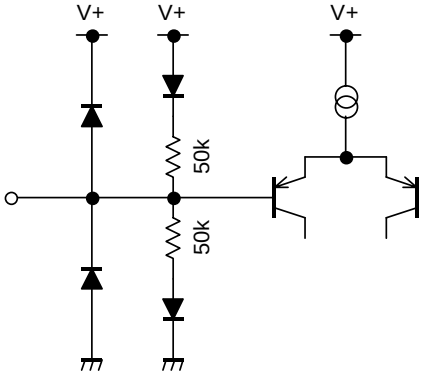
●CONTROL CHARACTERISTICS (V+=12V,Ta=25°C unless otherwise specified)

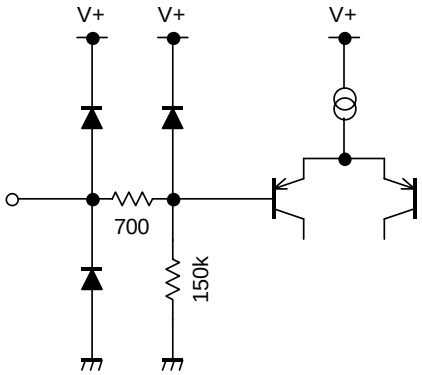
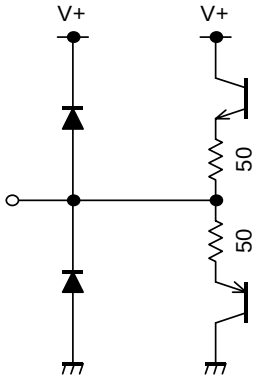
PARAMETER	SYMBOL	TEST CONDITION	INPUT L	INPUT R	OUTPUT	MODE	VR	MIN.	TYP.	MAX.	UNIT
Mode Select Control Voltage	V_{MODE}	V_{IN}= High Level	-	-	-	-	-	2.0	-	V+	V
		V_{IN}= Low Level	-	-	-	-	-	0.0	-	0.7	

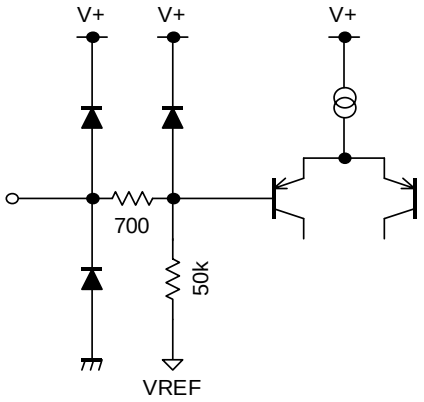
■MODE SWITCH

MODE	SW	NOTES
BYPASS	L	Input Through
Stereo	H	Surround Mode (Stereo Input)

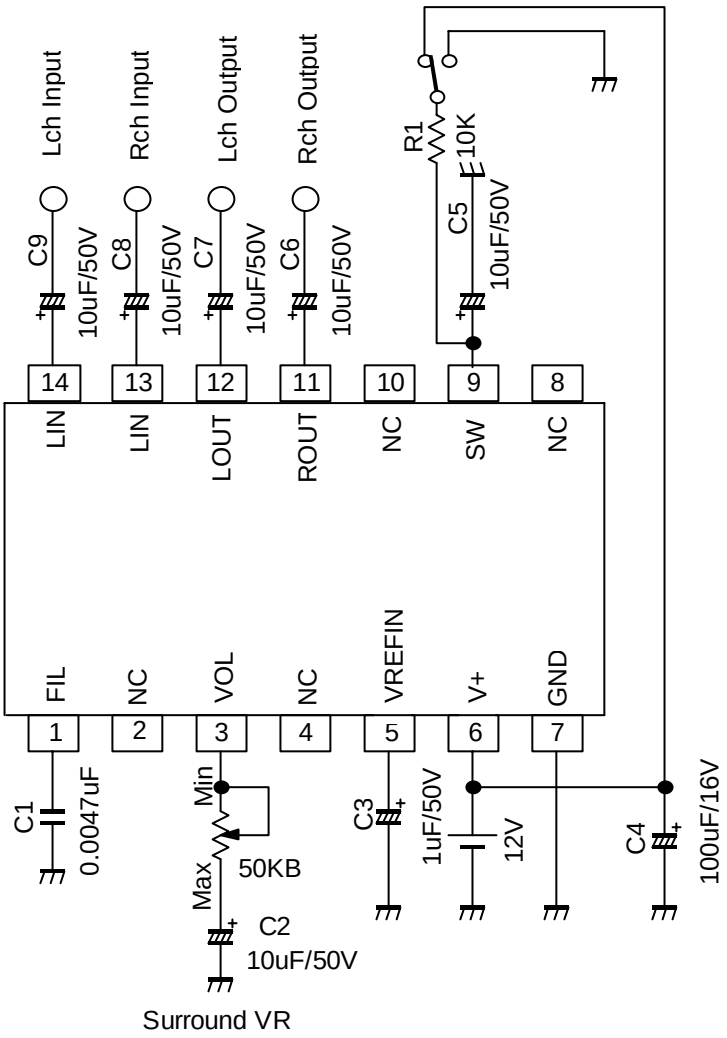
■TERMINAL DESCRIPTION

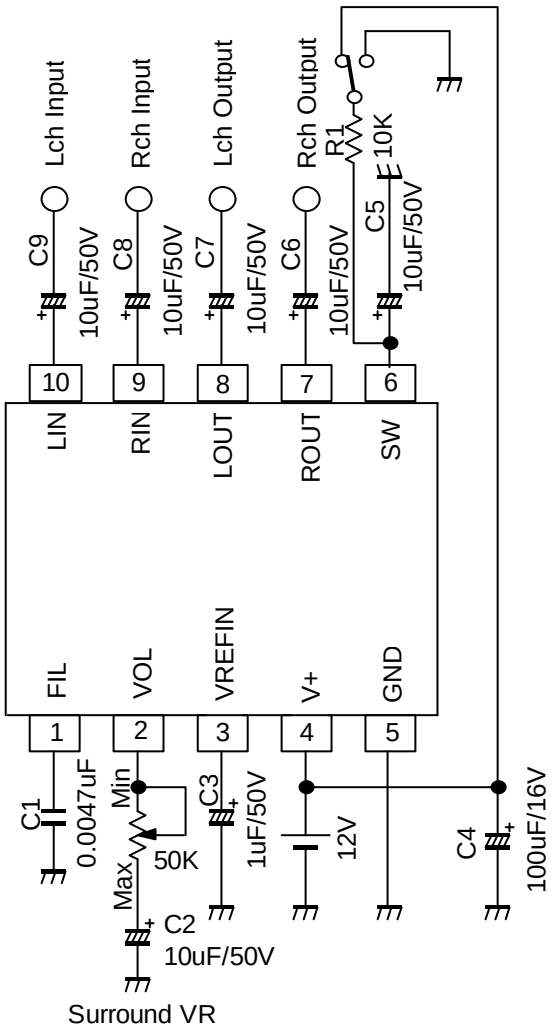
PIN NO. DIP14 DMP14	PIN NO. SSOP10	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1	1	FIL	Filter Input		V+/2
2 4 8 10	-	NC	Test pin	———	
3	2	VOL	Surround VR		V+/2
5	3	VREFIN	Reference Voltage Input		V+/2

PIN NO. DIP14 DMP14	PIN NO. SSOP10	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
6	4	V+	Power Supply	———	V+
7	5	GND	GND	———	0V
9	6	SW	Mode Control Switch		0V
11 12	7 8	ROUT LOUT	Rch Output Lch Output		V+/2

PIN NO.		SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
DIP14 DMP14	SSOP10				
13 14	9 10	RIN LIN	Rch Input Lch Input		V+/2

■APPLICATION CIRCUIT



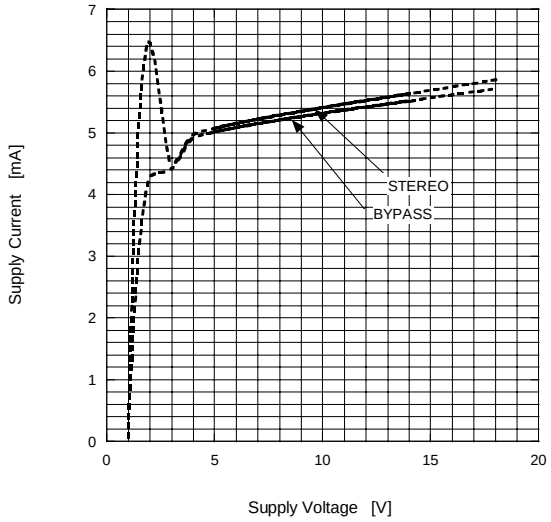


Parts No.	Value	Tolerance	Parts No.	Value	Tolerance
R1	10kΩ	5%	C3	1μF	20%
C1	0.0047μF	5%	C4	100μF	20%
C2,C5,C6,C7,C8,C9	10μF	20%			

■TYPICAL CHARACTERISTICS

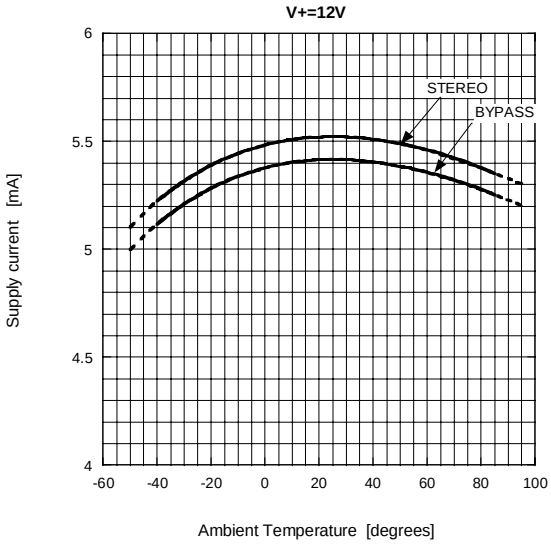
Supply Current vs Supply Voltage

V+=1 to 18V Ta=25degrees



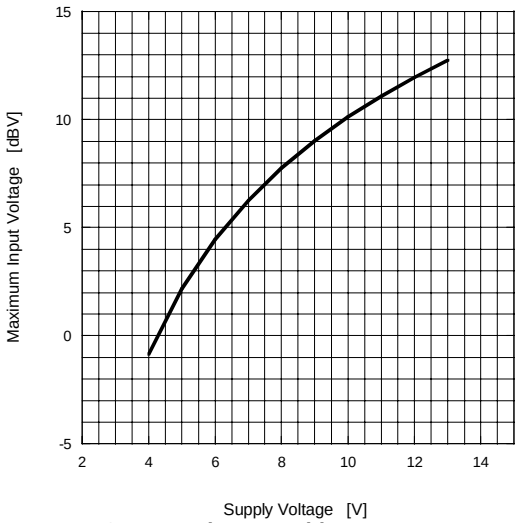
Supply Current vs Ambient Temperature

V+=12V



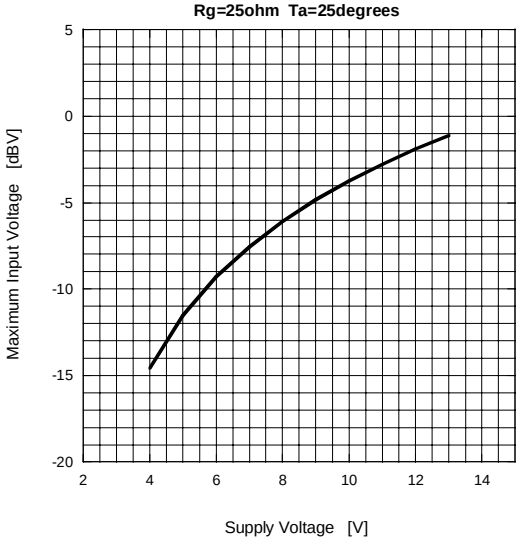
Maximum Input Voltage vs Supply Voltage (BYPASS)

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



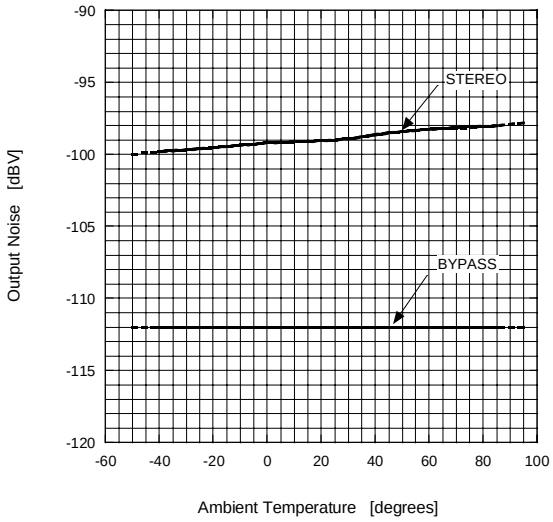
Maximum Input Voltage vs Supply Voltage (STEREO)

Vin=Lch Vout=Lch f=100Hz RL=47Kohm
Rg=25ohm Ta=25degrees



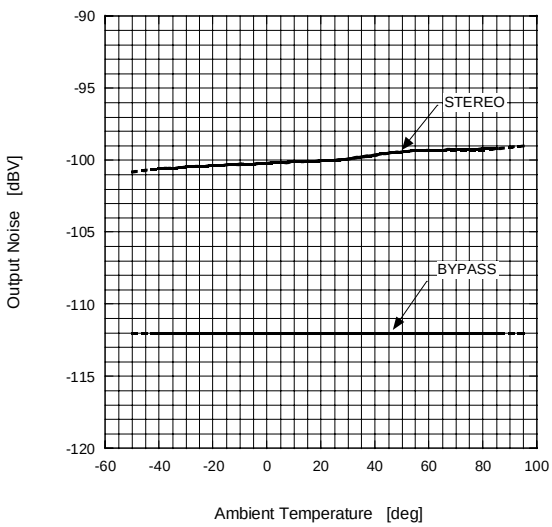
Output Noise vs Ambient Temperature

V+=12V Vin=GND Vout=Lch



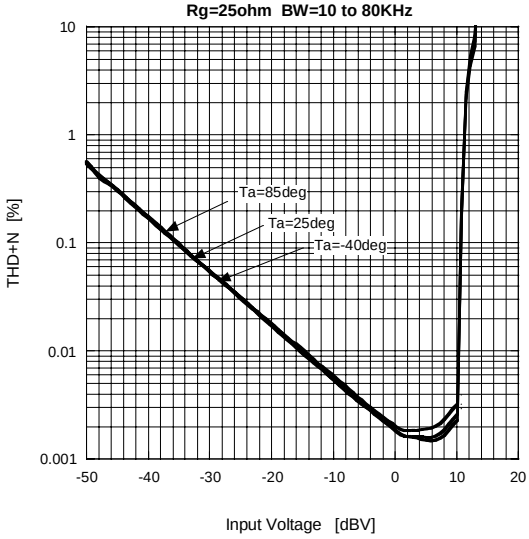
Output Noise vs Ambient Temperature

V+=12V Vin=GND Vout=Rch

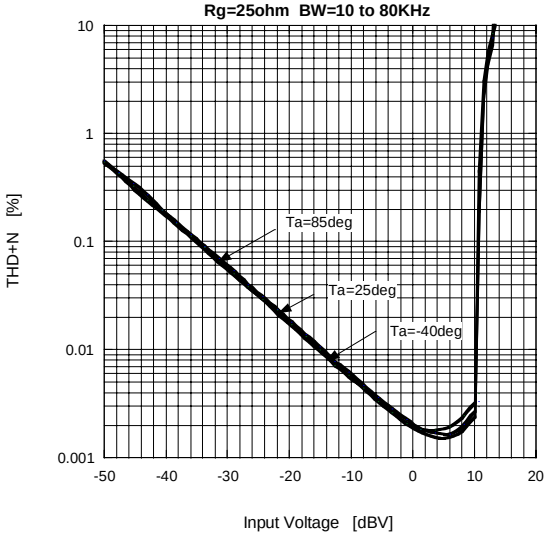


■TYPICAL CHARACTERISTICS

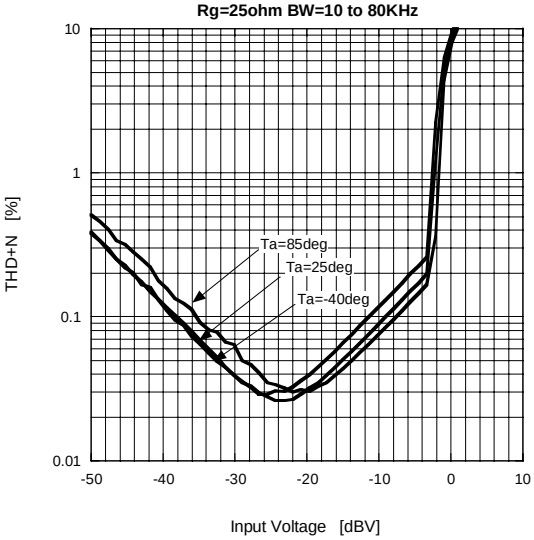
Total Harmonic Distortion vs Input Voltage (BYPASS)
V+=12V f=100Hz RL=47Kohm Rg=25ohm BW=10 to 80KHz



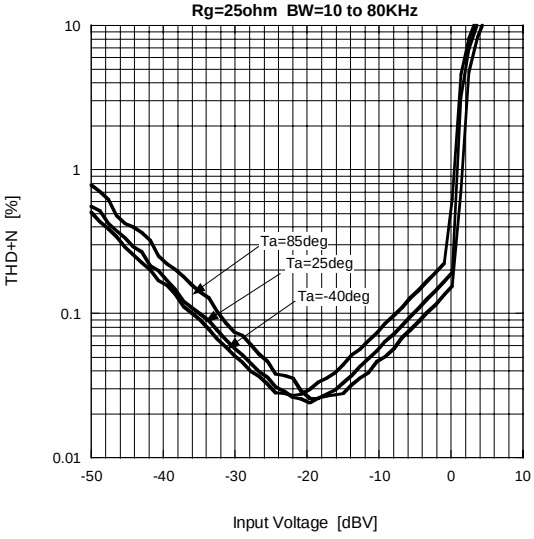
Total Harmonic Distortion vs Input Voltage (BYPASS)
V+=12V f=1KHz RL=47Kohm Rg=25ohm BW=10 to 80KHz



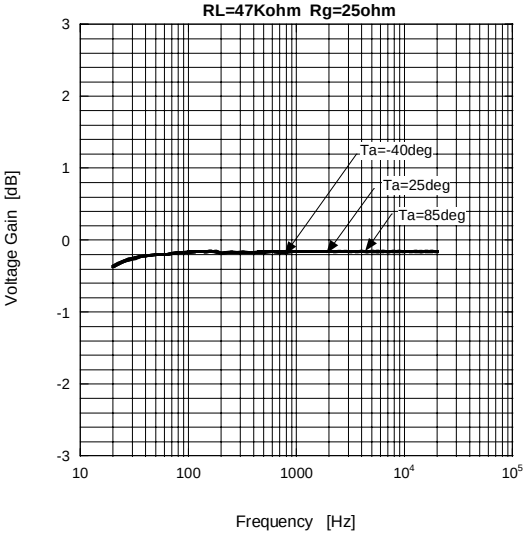
Total Harmonic Distortion vs Input Voltage (STEREO)
V+=12V f=100Hz RL=47Kohm Rg=25ohm BW=10 to 80KHz



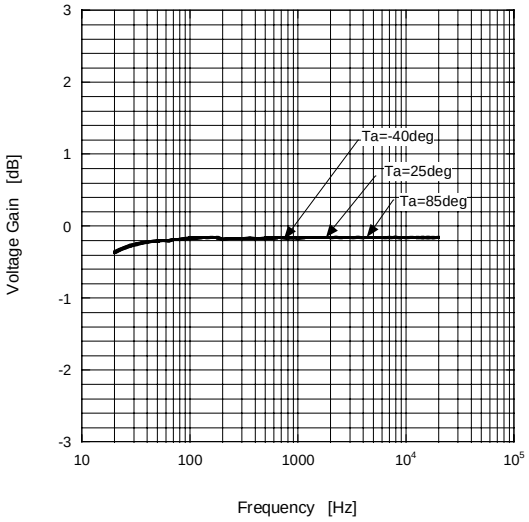
Total Harmonic Distortion vs Input Voltage (STEREO)
V+=12V f=1KHz RL=47Kohm Rg=25ohm BW=10 to 80KHz



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



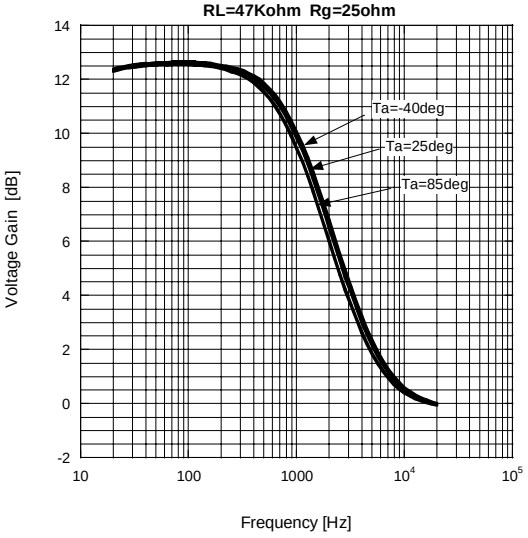
Voltage Gain vs Frequency Response (BYPASS)
V+=12V Vin=-10dBV Rch Vout=Rch RL=47Kohm Rg=25ohm



■TYPICAL CHARACTERISTICS

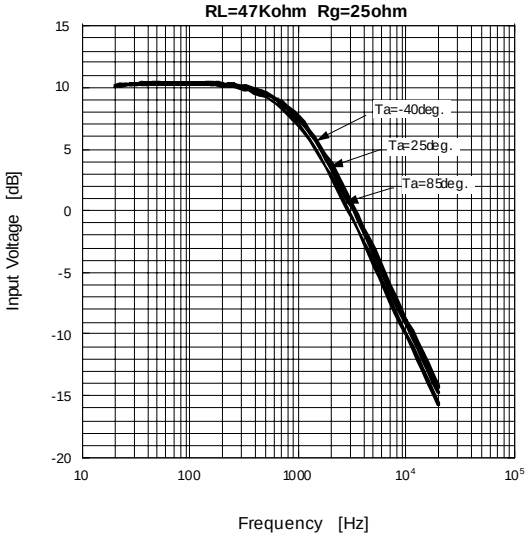
Voltage Gain vs Frequency Response (STEREO)

V+=12V Vin=-20dBV Lch Vout=Lch
RL=47Kohm Rg=25ohm



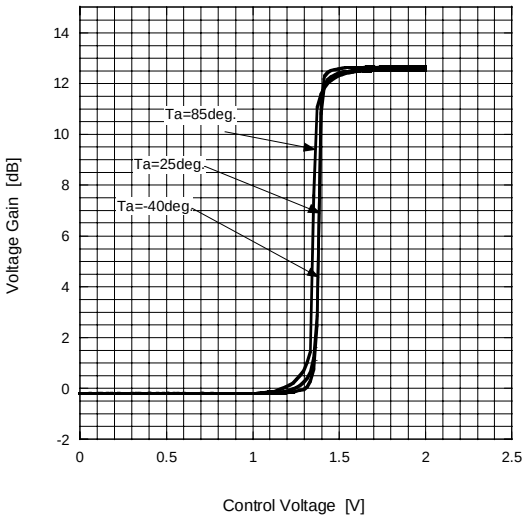
Voltage Gain vs Frequency Response (STEREO)

V+=12V Vin=-20dBV Lch Vout=Rch
RL=47Kohm Rg=25ohm



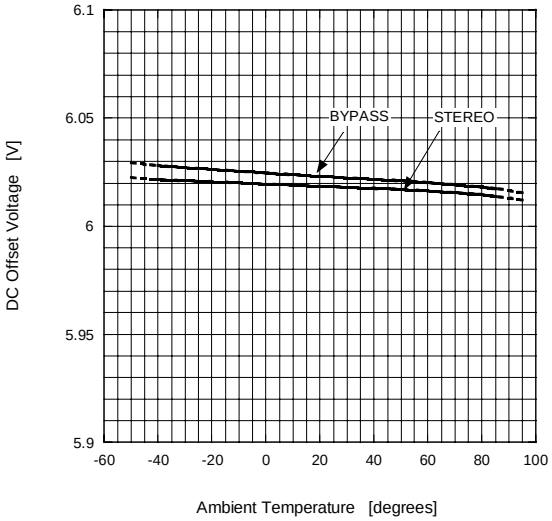
Voltage Gain vs SW Control Voltage

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



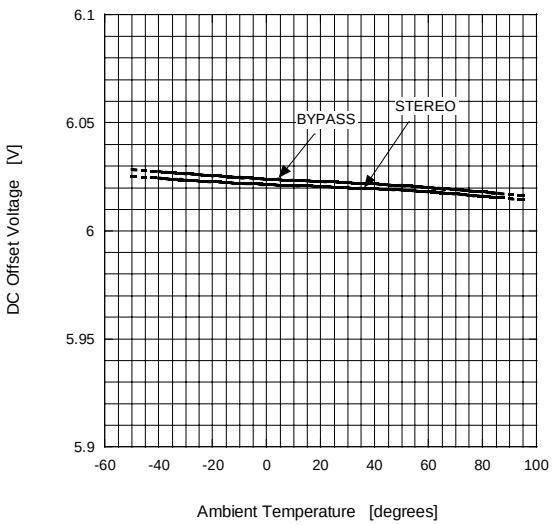
DC Offset Voltage vs Ambient Temperature

V+=12V Vout=Lch



DC Offset Voltage vs Ambient Temperature

V+=12V Vout=Rch



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