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LOW VOLTAGE AUDIO POWER AMPLIFIER

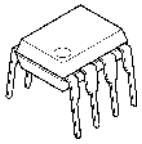
■ GENERAL DESCRIPTION

The NJM2113 is an audio power amplifier designed for telephone application, such as in speakerphones. Coupling capacitors to the speaker are not required,as it has differential speaker outputs.

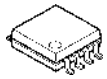
The closed loop gain is set with two external resistors.

A CD pin permit powering down with muting the input signal.

■ PACKAGE OUTLINE



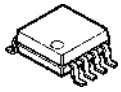
NJM2113D
(DIP8)



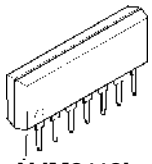
NJM2113M
(DMP8)

NJM2113E
(SOP8)

NJM2113V
(SSOP8)



NJM2113R
(VSP8)



NJM2113L
(SIP8)

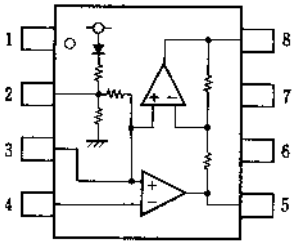
■ FEATURES

- Wide Operating Voltage (2~16V)
- Low Operating Current (2.7mA Typ.)
- CD Input to Power Down the IC with Mute
- Low Power-Down Operating Current (72μA Typ.)
- Output Power Exceeds 250mW (V^+=6V,R_L=32Ω)
- Gain Adjustable (G_{VD}=0~43dB,Voice Band)
- Package Outline DMP8, DIP8, SOP8 JEDEC 150mil
  SIP8, SSOP8, VSP8
- Bipolar Technology

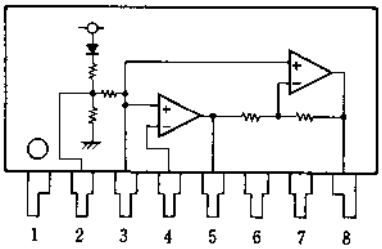
■ RECOMMENDED OPERATING CONDITIONS

● Load Impedance	R_L	8~200Ω
● Differential Gain	G_{VD}	0~43dB (5kHz bandwidth)
● Input Voltage at CD	V_{CD}	0~V^+ Vdc

■ PIN CONFIGURATION



NJM2113D
NJM2113M
NJM2113E
NJM2113V
NJM2113R

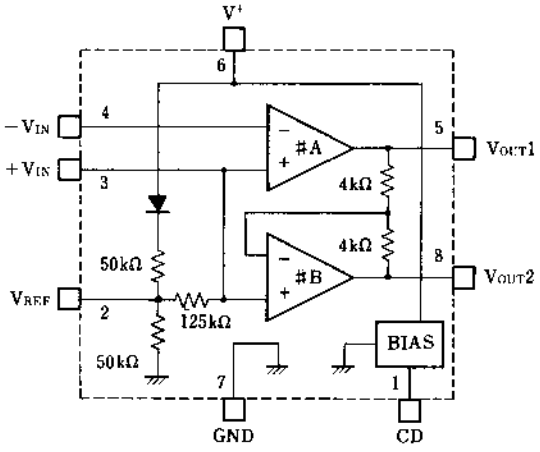


NJM2113L

PIN FUNCTION

1. CD
2. V_{REF}
3. $+V_{IN}$
4. $-V_{IN}$
5. $V_{OUT}1$
6. V^+
7. GND
8. $V_{OUT}2$

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	+18	V
Output Peak Current	I_{OP}	± 250	mA
Input Voltage Range	V_{IN}	(1~4pin)-0.3 to V^++0.3 (5,8pin)-0.3 to V^++0.3 (when Power-Down)	V
Power Dissipation	P_D	(DIP8) 500 (note1) (SIP8) 800 (note1) (DMP8) 500 (note2) (SSOP8) 360 (note2) (VSP8) 320 (note1) (SOP8) 300 (note1)	mW
Operating Temperature Range	T_{opr}	-20~+75	°C
Storage Temperature Range	T_{stg}	-40~+125	°C

(note1) Device itself.
(note2) Mounted on PC Board.

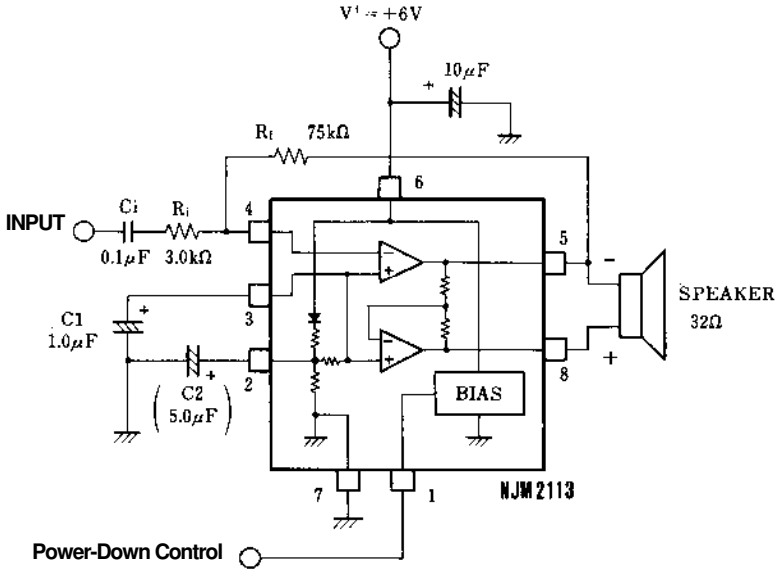
■ ELECTRICAL CHARACTERISTICS

(V^+=6V,Ta=25°C,unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	$I_{CC}1$	V^+=3.0V,R_L=∞,1pin=0.8V	-	2.7	4.0	mA
(no signal)	$I_{CC}2$	V^+=16.0V,R_L=∞,1pin=0.8V	-	3.4	5.0	mA
	I_{CCD}	V^+=3.0V,R_L=∞,1pin=2.0V	-	72	100	μA
Open Loop Gain	A_V1	Amplifier#A,f<100Hz	77	83	-	dB
Closed Loop Gain	A_V2	Amplifier#B,f=1kHz,R_L=32Ω	-0.35	0	+0.35	dB
Output Power	P_O1	V^+=3.0V,R_L=16Ω,THD≤10%	55	-	-	mW
(note3)	P_O2	V^+=6.0V,R_L=32Ω,THD≤10%	250	-	-	mW
	P_O3	V^+=12.0V,R_L=100Ω,THD≤10% (note4)	400	-	-	mW
Total Harmonic Distortion	THD1	V^+=6V,R_L=32Ω,P_O=125mW,G_{VD}=34dB	-	0.5	1.0	%
(f=1kHz)	THD2	V^+≥3V,R_L=8Ω,P_O=20mW,G_{VD}=12dB	-	0.5	-	%
	THD3	V^+≥12V,R_L=32Ω,P_O=200mW,G_{VD}=34dB	-	0.6	-	%
Power Supply Rejection Ratio	PSRR1	C1=∞,C2=0.01μF,DC	50	-	-	dB
(V^+=6.0V,ΔV^+=3.0V)	PSRR2	C1=0.1μF,C2=0,f=1kHz	-	12	-	dB
	PSRR3	C1=1.0μF,C2=5.0μF,f=1kHz	-	52	-	dB
Mute Attenuation	MAT	f=1kHz~20kHz,1pin=2.0V	-	70	-	dB
Output Voltage	V_O1	V^+=3.0V,R_L=16Ω	1.00	1.18	1.25	V
(R_f=75kΩ,DC)	V_O2	V^+=6.0V	-	2.68	-	V
	V_O3	V^+=12.0V	-	5.71	-	V
Output High Level	V_{OH}	I_{OUT}=-75mA,V^+=2.0~16.0V	-	V^+-1.1	-	V
Output Low Level	V_{OL}	I_{OUT}=75mA,V^+=2.0~16.0V	-	0.21	-	V
Output DC Offset	ΔV_O	R_f=75kΩ,R_L=32Ω,5pin~8pin	-30	0	+30	mV
Input Bias Current	I_B	4pin	-	-30	-200	nA
Equivalent Resistance	R_{+IN}	3pin	100	150	220	kΩ
	R_{REF}	2pin	18	25	40	kΩ
CD Input Voltage H	V_{CDH}	1pin	2.0	-	V^+	V
CD Input Voltage L	V_{CDL}	1pin	0.0	-	0.8	V
CD Input Resistance	R_{CD}	V_{CD}=16.0V,1pin	50	75	175	kΩ

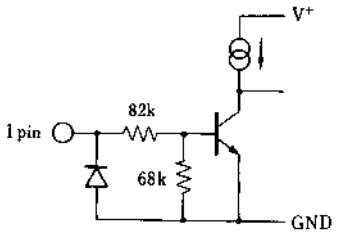
(note3) NJM2113M,NJM2113V : At on PC Board
(note4) Not specified for NJM2113V,NJM2113R

■ APPLICATION CIRCUIT



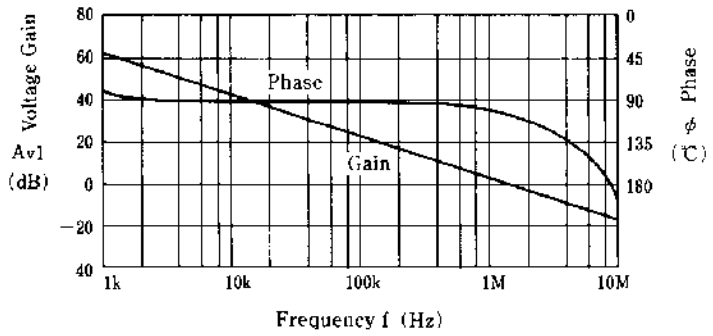
(note)

1. The NJM2113 is active mode during the CD terminal is Low level (<0.8V) and it is stand-by mode during the CD terminal is High level (>2.0V)
2. C1 and C2 improve power supply rejection ratio.
   In case of C1 is enough large,C2 is unnecessary.
3. Please note that the C1 and C2 make slow power rise up to the NJM2113 regardless the external power supply condition.
4. Input current flow on the internal resistor shown in the equivalent circuit of CD terminal.
5. No snubber resistor and capacitor are required normally.
   But the snubber resistor and capacitor are required if the NJM2113 oscillates by Condition of PCB layout,stray capacitor and speaker wire length.



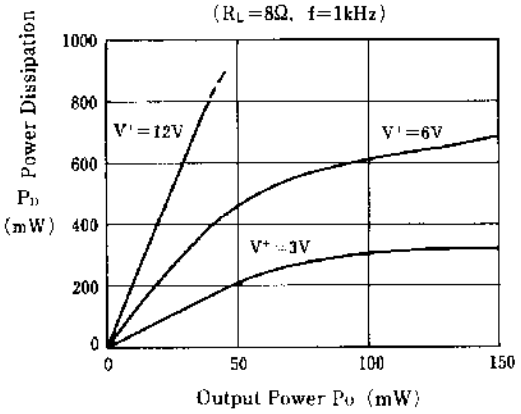
■ TYPICAL CHARACTERISTICS

AMP#A Loop Gain, Phase vs. Frequency



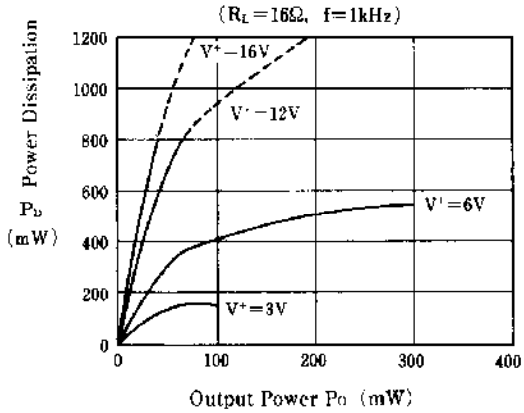
Power Dissipation vs. Output Power

(R_L=8Ω, f=1kHz)



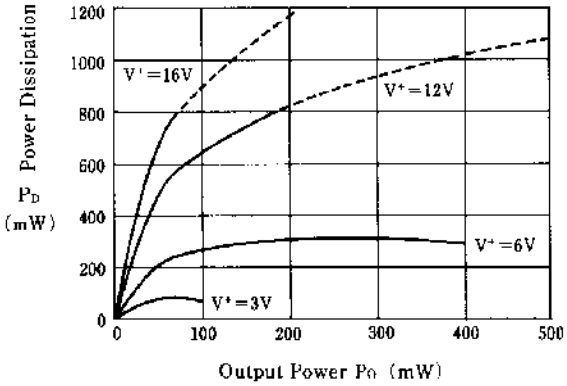
Power Dissipation vs. Output Power

(R_L=16Ω, f=1kHz)



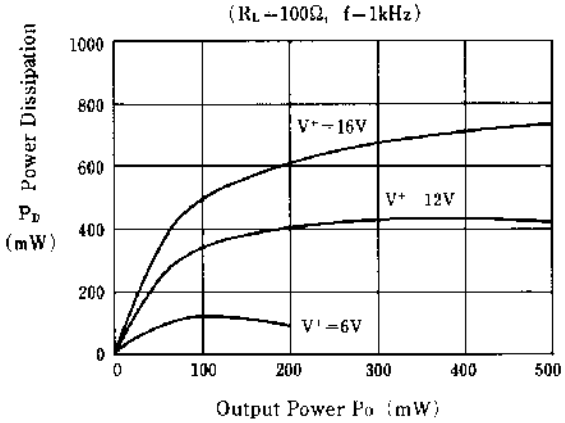
Power Dissipation vs. Output Power

(R_L=32Ω, f=1kHz)



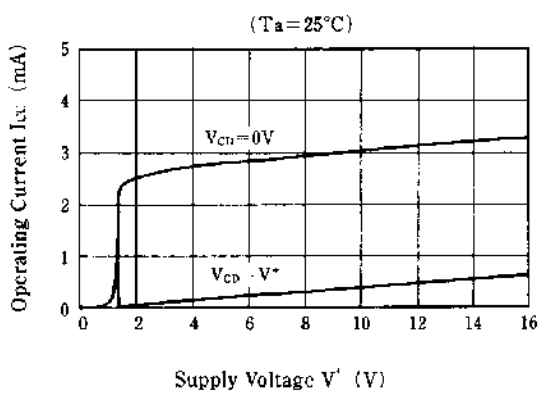
Power Dissipation vs. Output Power

(R_L=100Ω, f=1kHz)

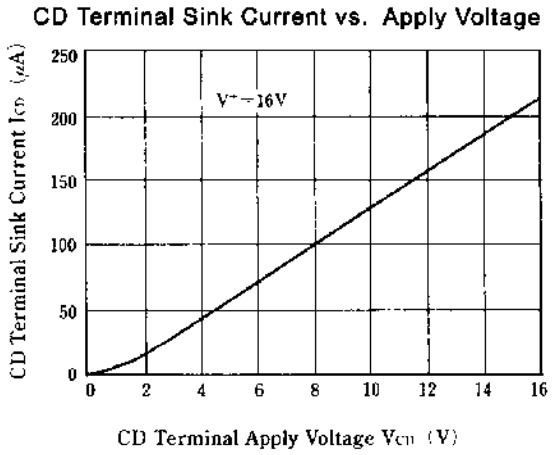


■ TYPICAL CHARACTERISTICS

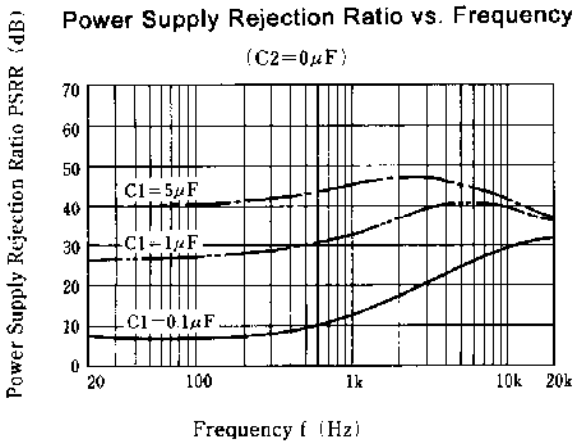
Operating Current vs. Supply Voltage



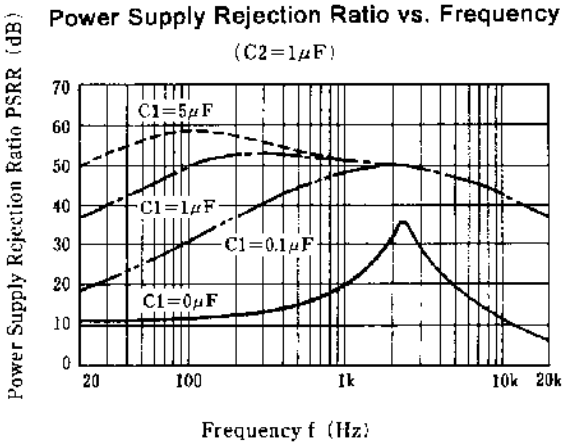
CD Terminal Sink Current vs. Apply Voltage



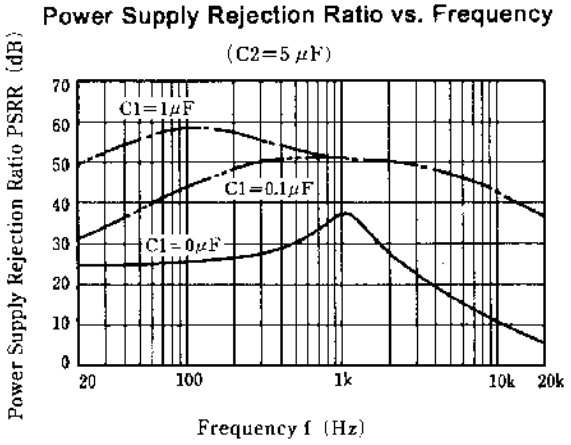
Power Supply Rejection Ratio vs. Frequency



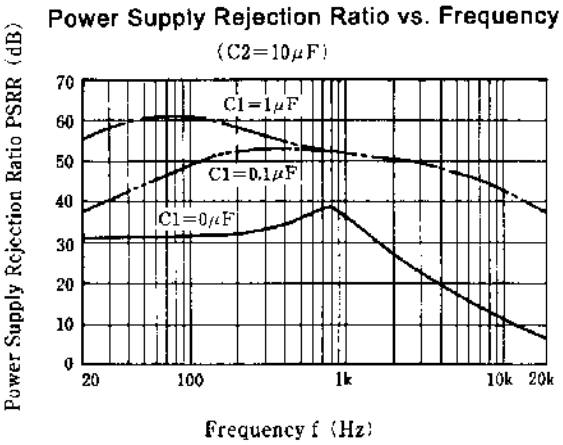
Power Supply Rejection Ratio vs. Frequency



Power Supply Rejection Ratio vs. Frequency

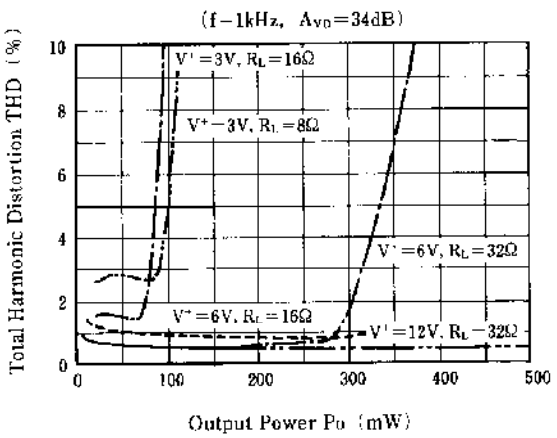


Power Supply Rejection Ratio vs. Frequency

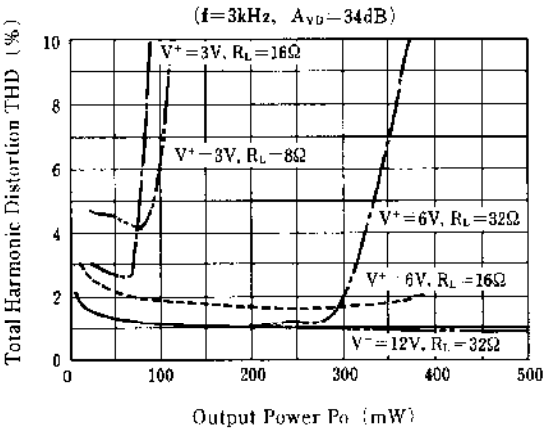


■ TYPICAL CHARACTERISTICS

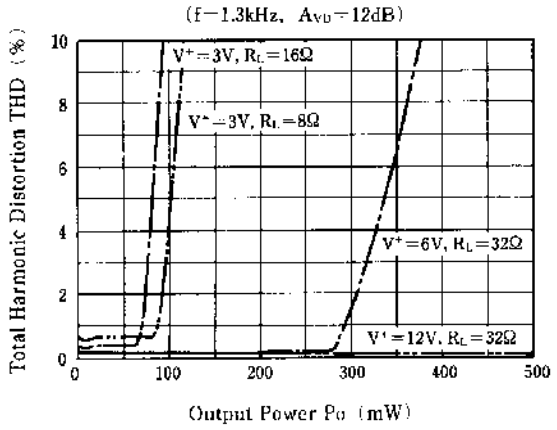
Total Harmonic Distortion vs. Output Power



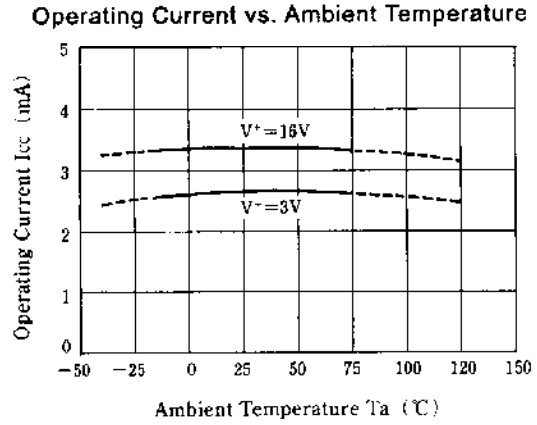
Total Harmonic Distortion vs. Output Power



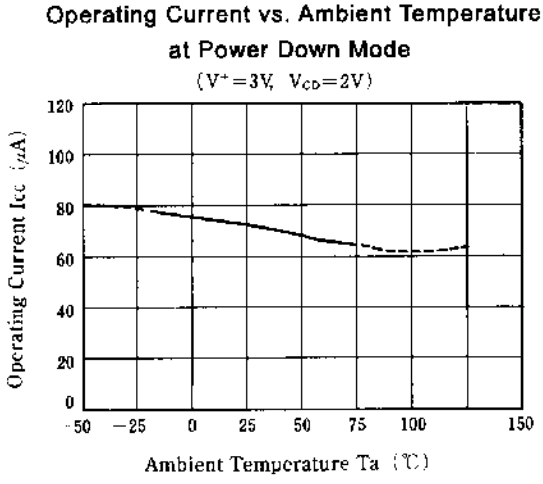
Total Harmonic Distortion vs. Output Power



Operating Current vs. Ambient Temperature



Operating Current vs. Ambient Temperature at Power Down Mode



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