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SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

Bi-CMOS LSI

LV4912GP — Class-D Audio Power Amplifier BTL 2W×1ch

Overview

The LV4912GP is analog input type digital power amplifier with 2W × 1 channel. By using an original feed back technology, it improves sound quality through it is class-D power amplifier and the LC filter in the output stage can be deleted as application.

Features

- Enabling output LC filter-less.
- Class-D amplifier system of the output BTL type.
- Improve the sound quality by the use of original feedback technology.
- Realized high efficiency class-D amplifier.
- Reduce the pop sound at ON/OFF state by the use of soft mute function.
- Full complement of built-in protection circuits : over current protection, thermal protection, and low power supply voltage protection circuits.
- Internal oscillation frequency : 280kHz

Functions

- Output power : 2W(VD = 5V, R_L = 4Ω, THD + N = 10%)
- THD + N : 0.4% (VD = 5V, R_L = 4Ω, fin = 1kHz, P_O = 1W, Filter : AES17)
- Noise : 70μVrms (Filter : DIN AUDIO)
- Package : VCT24 (3.5 × 3.5)

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	VD	Externally applied voltage	6	V
Allowable power dissipation	Pd max	Mounted on a board *	1	W
Operating temperature	Topr		-20 to +75	°C
Storage temperature	Tstg		-40 to +150	°C

∗ When mounted on the specified printed circuit board : 40mm×50mm×1.6mm, glass epoxy

Recommended Operation Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage range	VD	Externally applied voltage	2.7	5	5.5	V
Load impedance renge	R_L	Speaker load	4			Ω

Electrical Characteristics at Ta = 25°C, VD = 5V, R_L = 4Ω, L = 22μH, C = 0.33μF

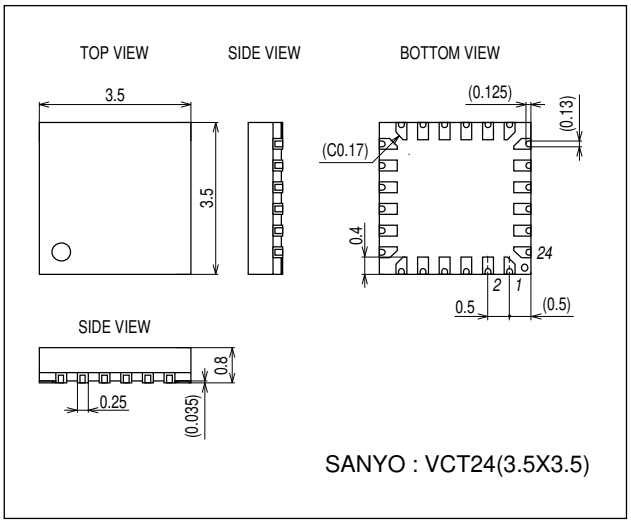
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating current						
Standby current	Ist	$\overline{STBY}$ = L, $\overline{MUTE}$ = L, LC less, R_L = OPEN		1	8	μA
Mute current	Imute	$\overline{STBY}$ = H, $\overline{MUTE}$ = L, LC less, R_L = OPEN		4.5	7.5	mA
Quiescent current	I_{CCO}	$\overline{STBY}$ = H, $\overline{MUTE}$ = H, LC less, R_L = OPEN		6	10	mA
Main amplifier						
Voltage gain	VG	fin = 1kHz, V_O = 0dBm	21.5	23.5	25.5	dB
Total harmonic distortion	THD+N	P_O = 1W, fin = 1kHz, AES17		0.4	0.7	%
Output power	P_O	THD+N = 10%, fin = 1kHz, AES17	1.6	2		W
Ripple rejection ratio	SVRR	fr = 100Hz, Vr = -15dBm, Rg = 0, DIN AUDIO	50	60		dB
Noise	V_{NO}	Rg = 0, DIN AUDIO		70	210	μVrms
Digital input						
High-level output voltage	V_{IH}	STBY pin, MUTE pin	3			V
Low-level output voltage	V_{IL}	STBY pin, MUTE pin			0.3	V
Protection circuit						
Power supply voltage drop protection circuit upper limit value	UV_UPPER	VD pin voltage monitor		2.3		V
Power supply voltage drop protection circuit lower limit value	UV_LOWER	VD pin voltage monitor		2.2		V

Note : The values of these characteristics were measured in the SANYO test environment. The actual values in an end system will vary depending on the printed circuit board pattern, the external components actually used, and other factors.

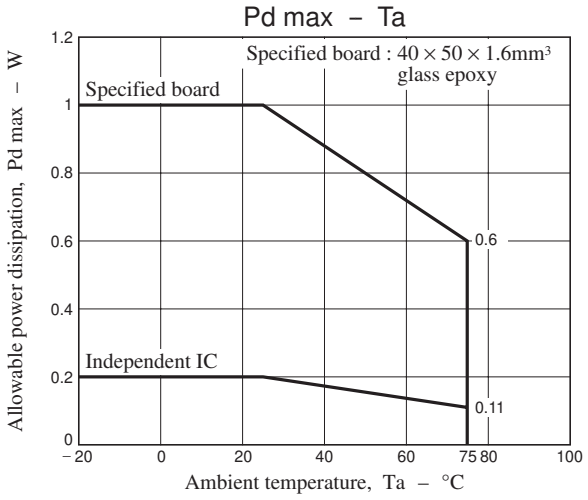
Package Dimensions

unit : mm (typ)

3322A



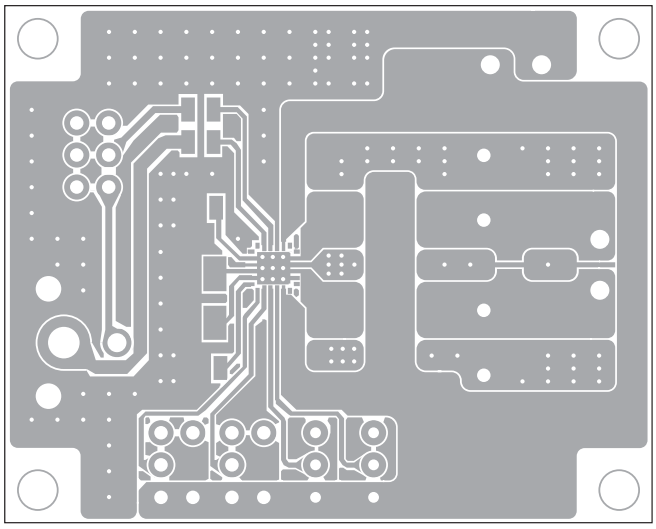
SANYO : VCT24(3.5X3.5)



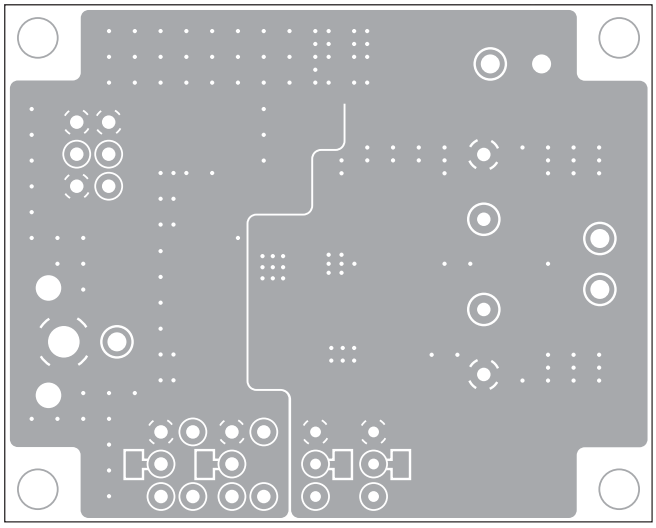
LV4912GP customer bread board rev.1.0

Size : 40mm × 50mm × 1.6mm
Pattern

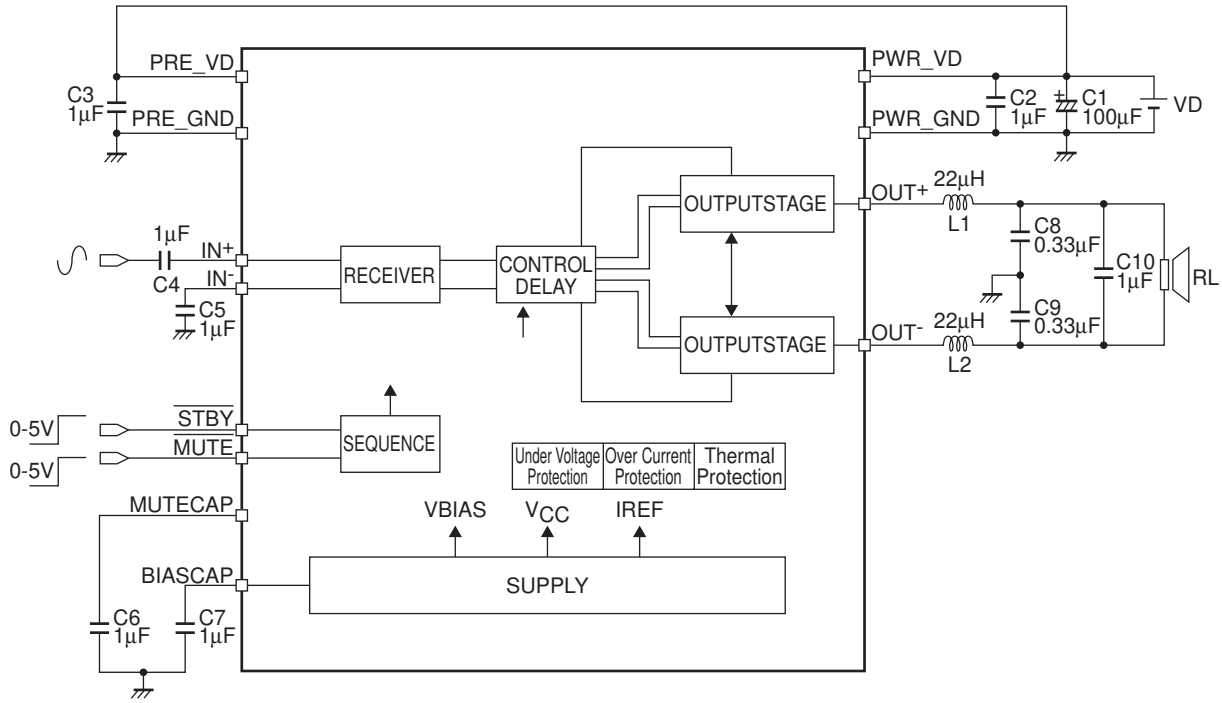
Top Layer



Bottom Layer



Block Diagram and Application Circuit Example ($R_L = 4\Omega$)

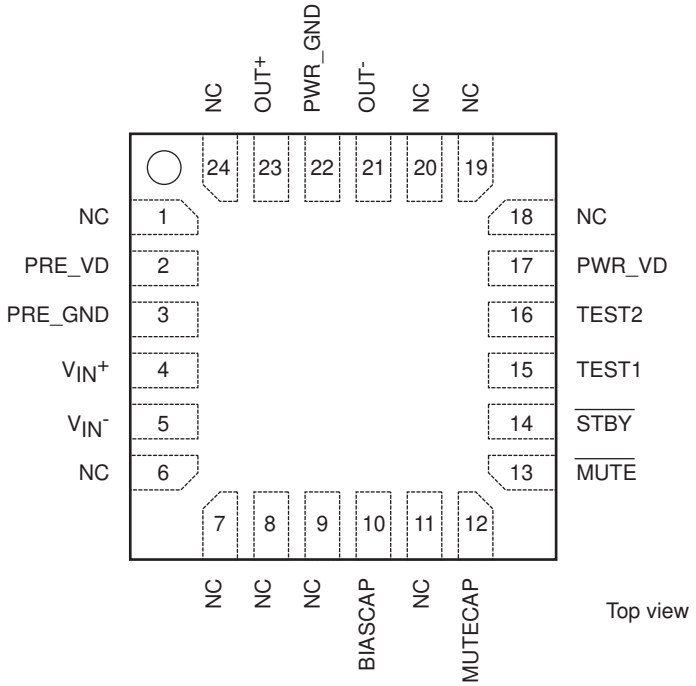


LV4912GP Application ($R_L = 4\Omega$)

Part List

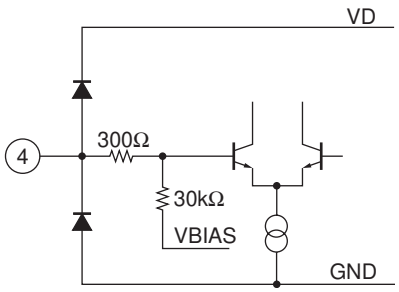
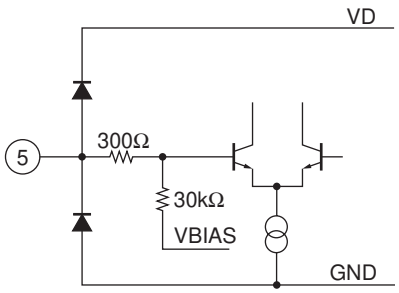
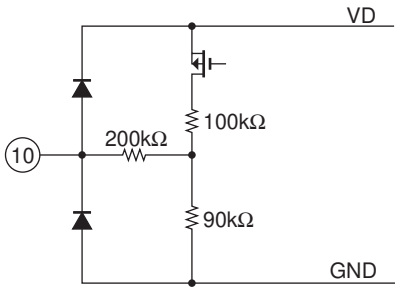
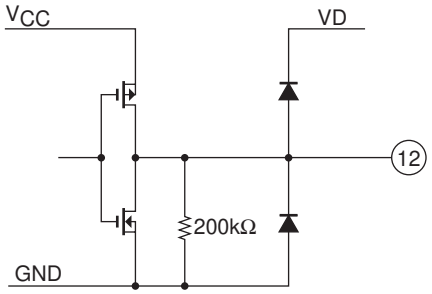
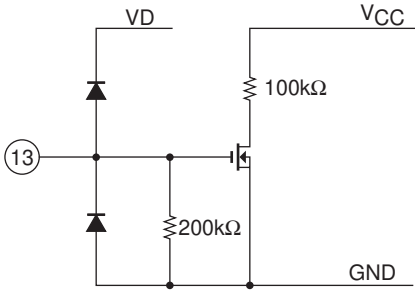
Parts Name	Part No.	Description Function
C_{VD}	C1	Power supply capacitor for VD
C_{VD}	C2, C3	High-frequency cut capacitor for VD
C_{IN}	C4, C5	Input capacitor
C_{MUTE}	C6	Capacitor for soft mute
$C_{BIASCAP}$	C7	Input coupling capacitor for Internal power supply (VBIAS)
L_O	L1, L2	Output L. P. F. coil
C_O	C8, C9, C10	Output L. P. F. capacitor

Pin Assignments



Top view

Pin Equivalent Circuit

Pin No.	Pin Name	I/O	Description	Equivalent Circuit
1	NC		No connection	
2	PRE_VD		Power supply pin	
3	PRE_GND		Pre ground	
4	V_{IN}^{+}	I	Input plus	
5	V_{IN}^{-}	I	Input minus	
6	NC		No connection	
7	NC		No connection	
8	NC		No connection	
9	NC		No connection	
10	BIASCAP	O	Internal power supply decoupling capacitor connection	
11	NC		No connection	
12	MUTECAP	O	Mute capacitor connection	
13	$\overline{\text{MUTE}}$	I	Mute control pin	

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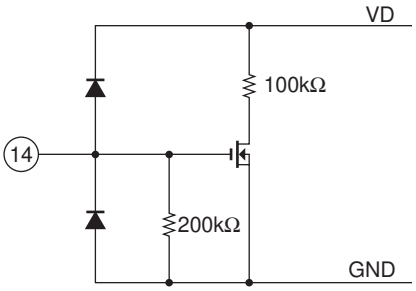
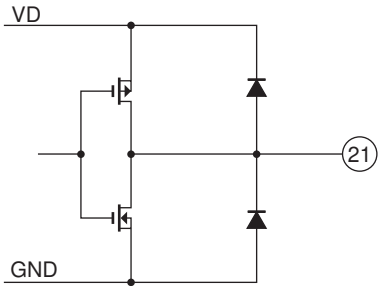
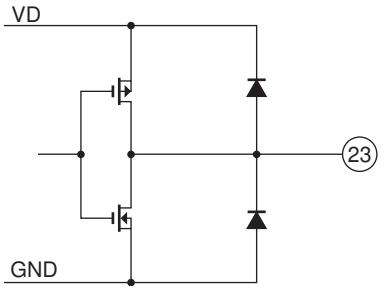
Pin No.	Pin Name	I/O	Description	Equivalent Circuit
14	$\overline{\text{STBY}}$	I	Standby control pin	
15	TEST1		Test pin	
16	TEST2		Test pin	
17	PWR_VD		Power supply pin	
18	NC		No connection	
19	NC		No connection	
20	NC		No connection	
21	OUT-	O	Output pin, minus	
22	PWR_GND		Power ground	
23	OUT+	O	Output pin, plus	
24	NC		No connection	

Description functions

1. System Standby

Each bias can be turned on/off by switching the STBY pin (pin 14) into high or low. The bias is turned off when the STBY pin is low. Conversely, the bias is turned on when the STBY pin is high.

STBY pin (pin 14)	Bias condition
High	ON
Low	OFF

2. Mute Function

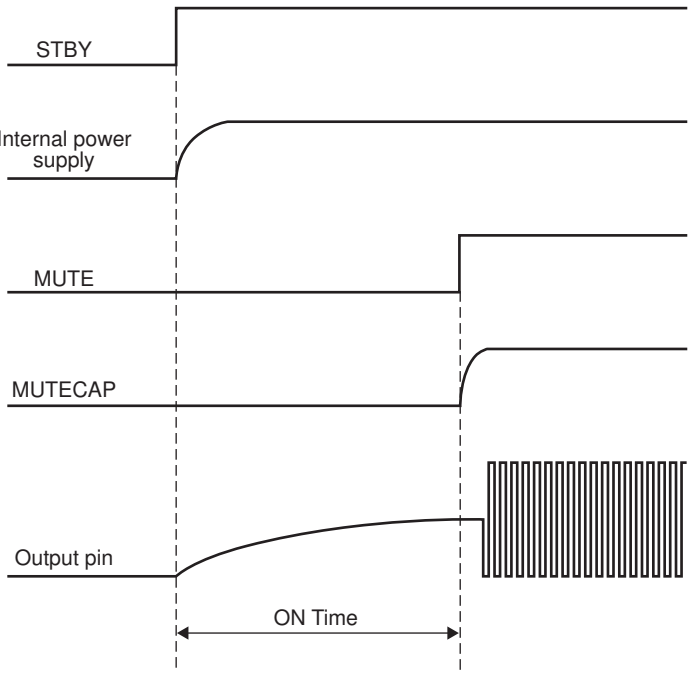
The mute of the output and reduction of power-on popping noise are mainly performed by the use of this function. By switching between high and low on the MUTE pin (pin 13), the output can be muted. The MUTE pin enters the mute mode (PWM output stops) when the MUTE pin is low. Also the MUTE pin enters the operation mode (normal operations) when the MUTE pin is high.

MUTE pin (pin 13)	Conditions
High	Operation mode
Low	Mute mode

We recommend the following sequence for reduction of the popping noise when power is on/off. Also, we recommend the following ON Time and OFF Time when P.4 the application circuit is used.

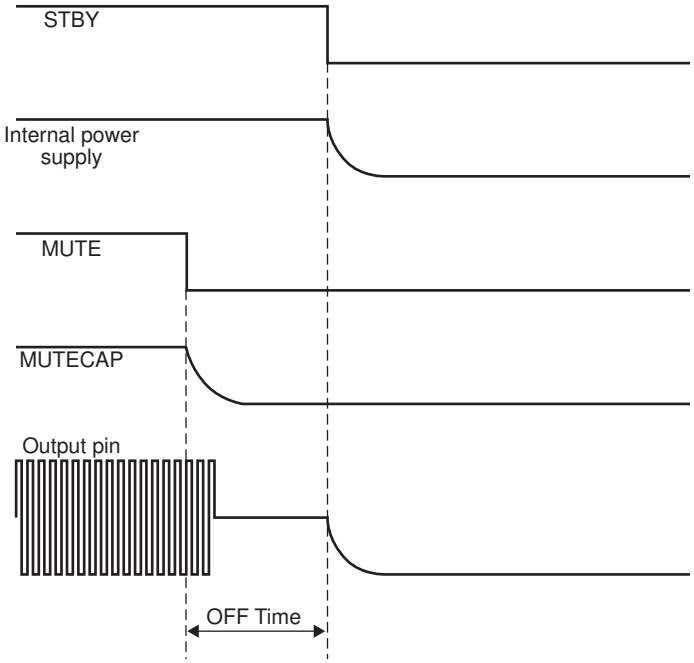
(1) Power On sequence

The ON Time should secure more than 150msec for reduction of the popping noise.



(2) Power Down sequence

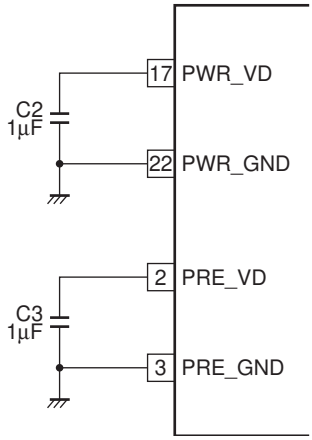
The OFF Time should secure more than 100msec for reduction of the popping noise.



Capacitors for Power supply and pin arrangement

1. Capacitors for power supply

The capacitors C2 and C3 for power supply connected between IC pins must be inserted using the shortest lines possible.

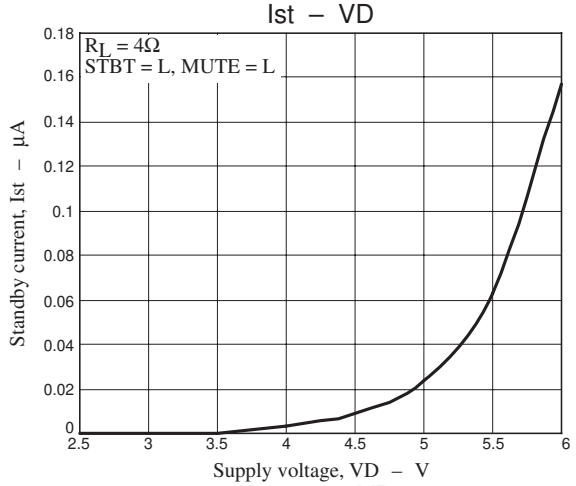


2. Pin arrangement of the test pins (pins 15 and 16)

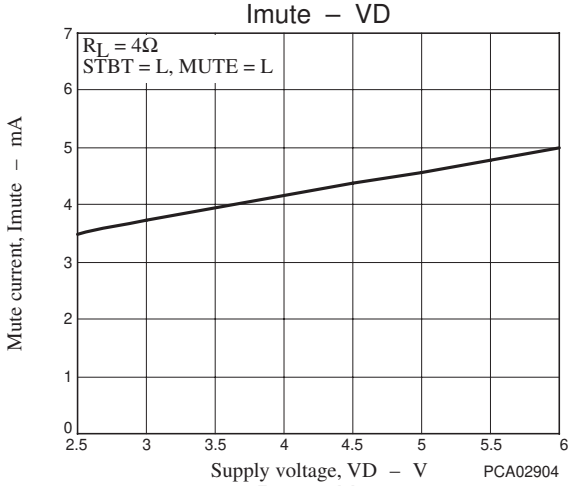
The test pins (pins 15 and 16) are used as pins for testing before shipment. These pins are not used normally. Therefore, these pins must be left open if the pin arrangement is not performed. Please make sure to connect these pins to GNDs if the pin arrangement is performed.

General Characteristics

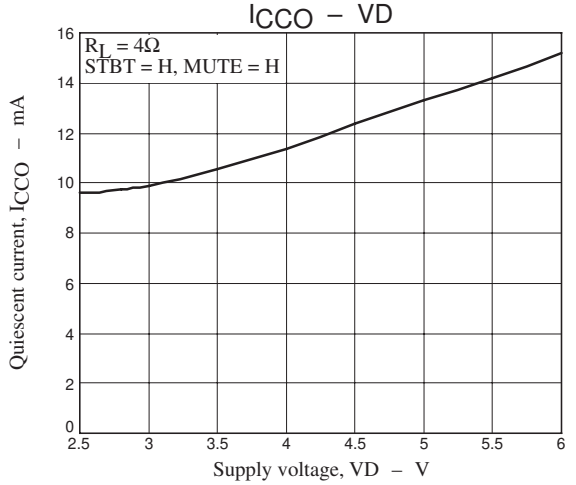
Ist – VD



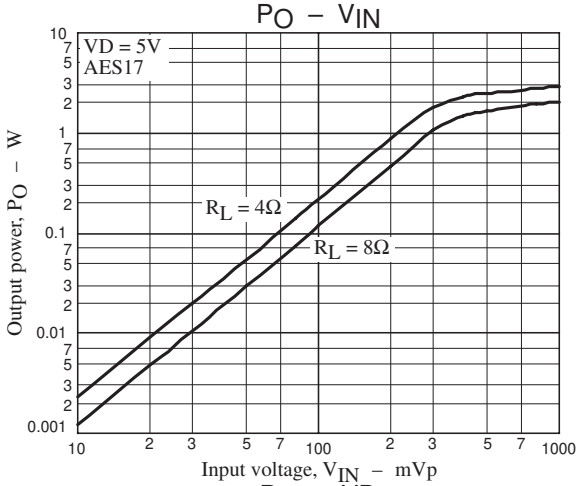
Imute – VD



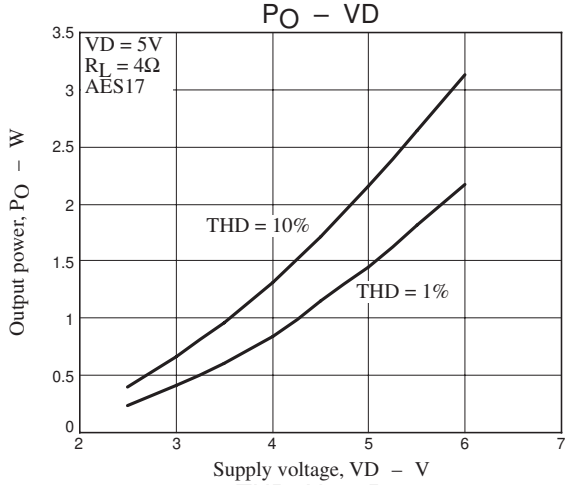
ICCO – VD



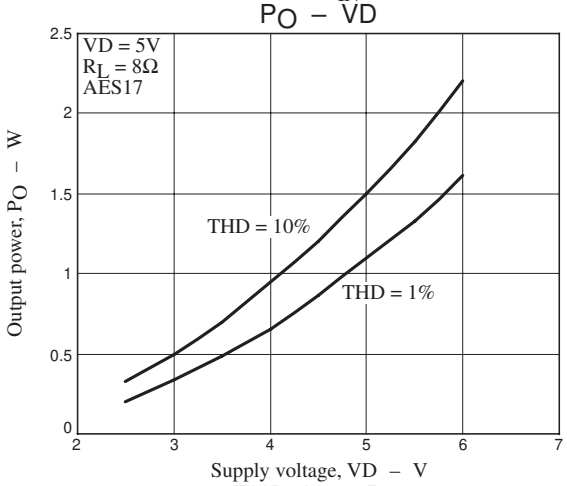
PO – VIN



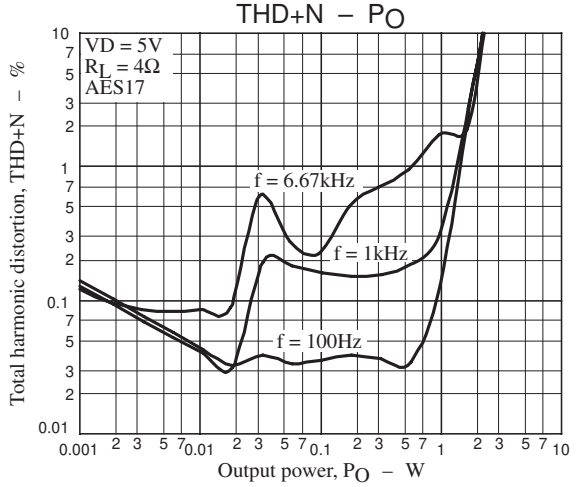
PO – VD



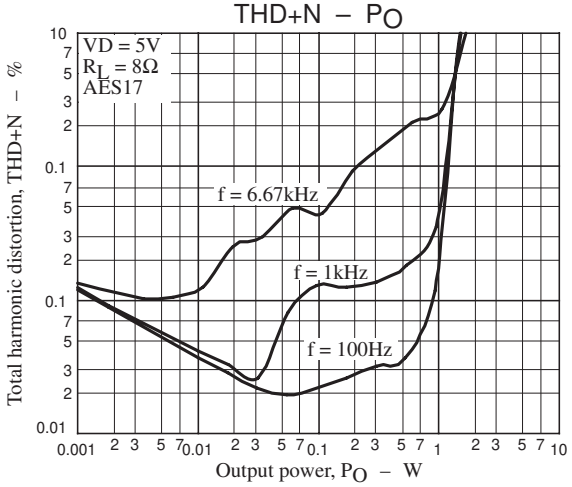
PO – VD



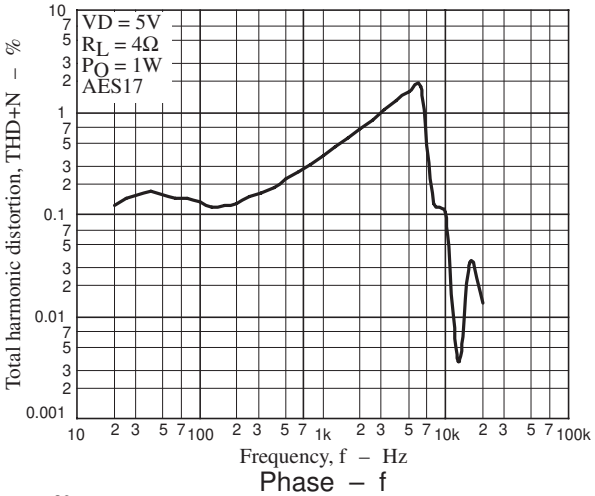
THD+N – PO



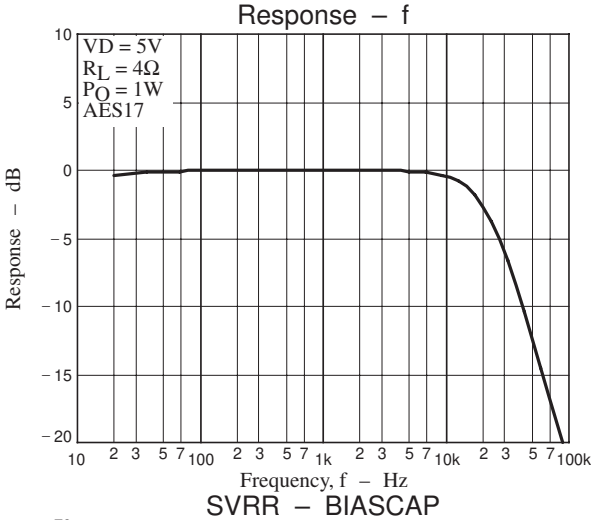
THD+N – PO



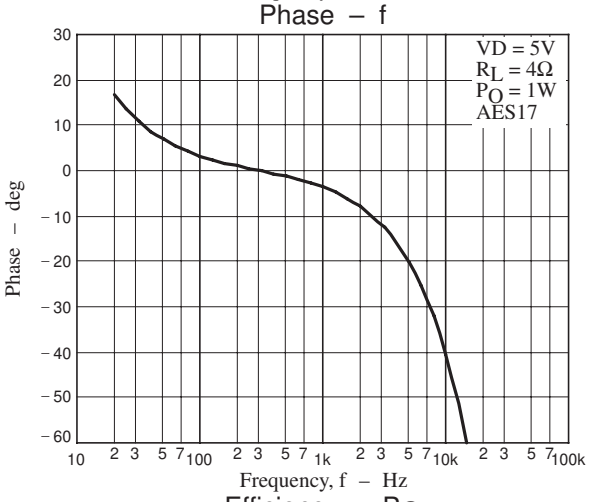
THD+N – f



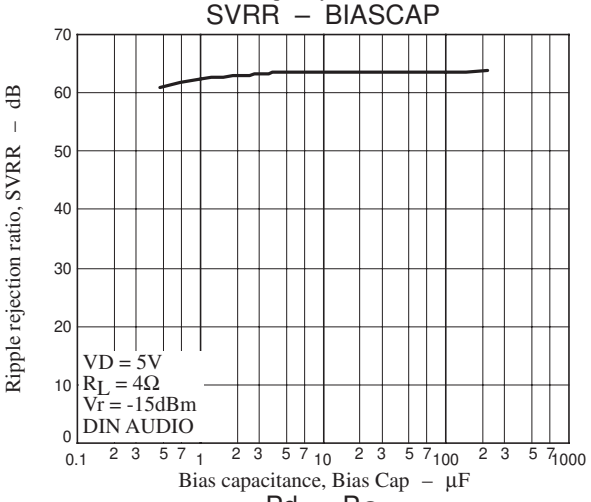
Response – f



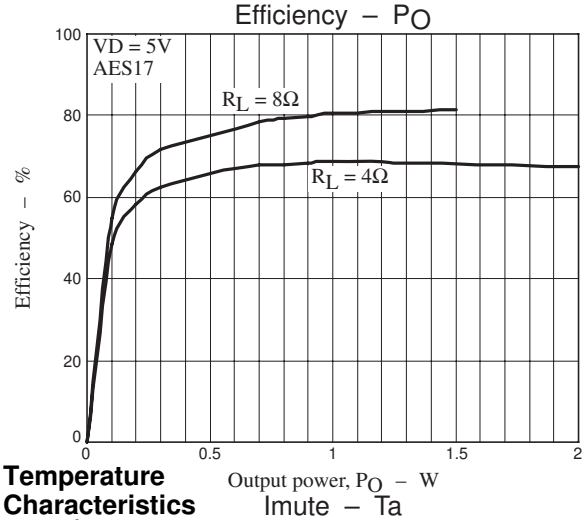
Phase – f



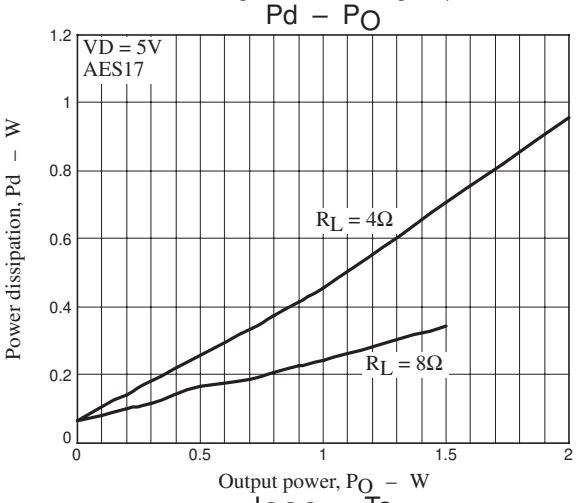
SVRR – BIASCAP



Efficiency – PO

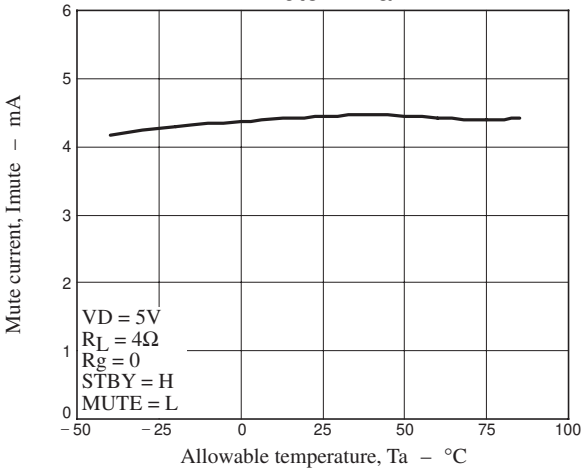


Pd – PO



Temperature Characteristics

Imute – Ta



ICCO – Ta