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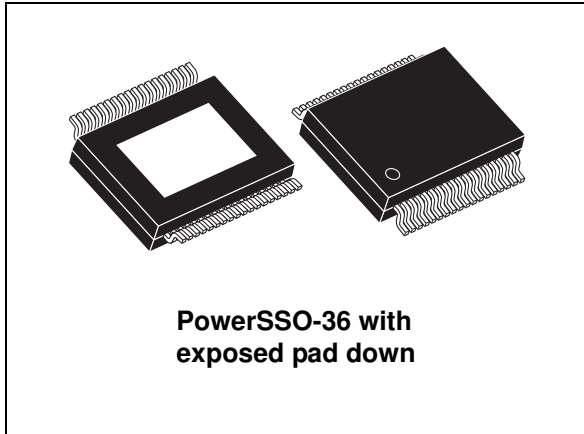## Contact us

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TDA7491HV

20 W + 20 W dual BTL class-D audio amplifier

Datasheet - production data

Description

The TDA7491HV is a dual BTL class-D audio amplifier with single power supply designed for LCD TVs and monitors.

Thanks to the high efficiency and exposed-pad-down (EPD) package no separate heatsink is required.

The TDA7491HV is pin-to-pin compatible with the TDA7491P and TDA7491LP.

PowerSSO-36 with exposed pad down

Features

- 20 W + 20 W continuous output power:
  R_L = 8 Ω, THD = 10% at V_{CC} = 18 V
- Wide-range single-supply operation (5 V - 18 V)
- High efficiency (η = 90%)
- Four selectable, fixed gain settings of nominally 20 dB, 26 dB, 30 dB and 32 dB
- Differential inputs minimize common mode noise
- No 'pop' at turn-on/off
- Standby and mute features
- Short-circuit protection
- Thermal overload protection
- Externally synchronizable

Table 1. Device summary

Order code	Operating temperature	Package	Packaging
TDA7491HV13TR	-40 to 85°C	PowerSSO-36 EPD	Tape and reel

This is information on a product in full production.

Contents

List of tables

List of figures

1   Device block diagram

Figure 1 shows the block diagram of one of the two identical channels of the TDA7491HV.

Figure 1. Internal block diagram (one channel only)
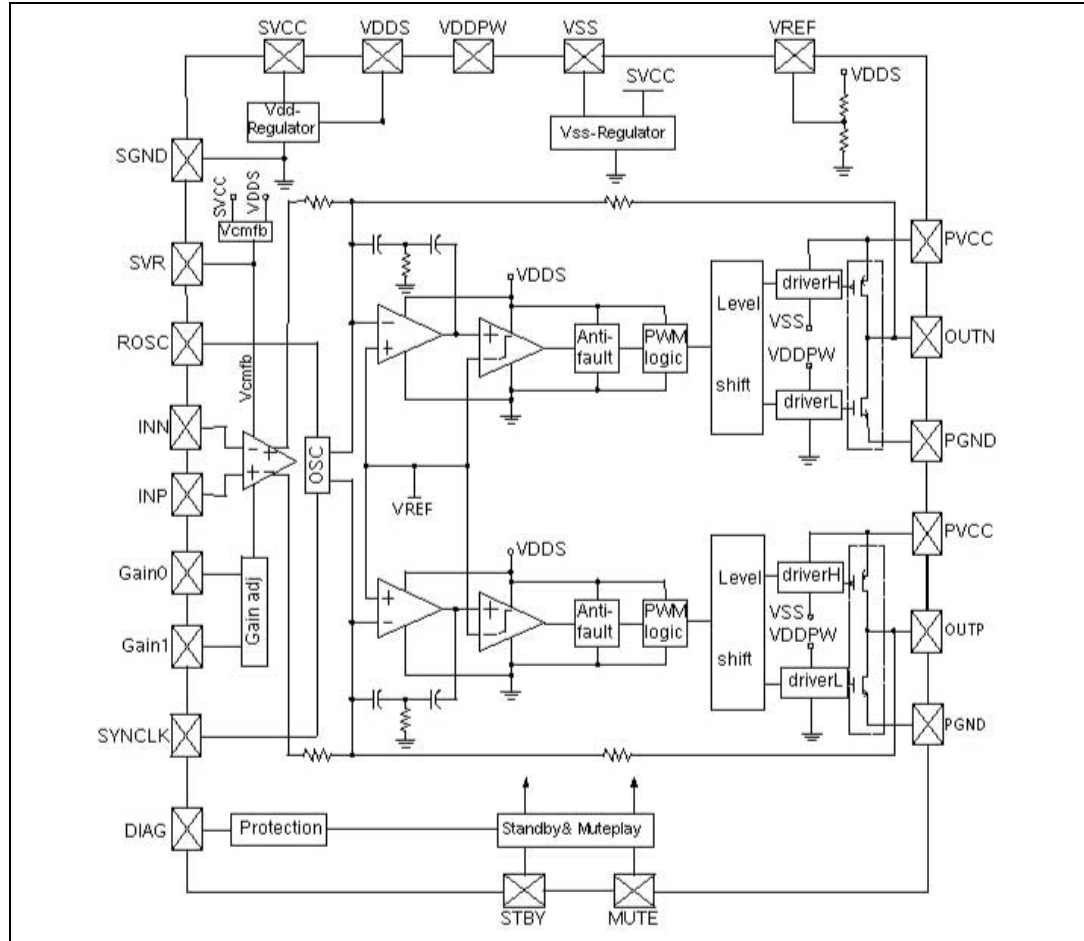
2   Pin description

2.1   Pinout

Figure 2. Pin connections (top view, PCB view)

SUB_GND	1 ○	36 VSS
OUTPB	2	35 SVCC
OUTPB	3	34 VREF
PGNDB	4	33 INNB
PGNDB	5	32 INPB
PVCCB	6	31 GAIN1
PVCCB	7	30 GAIN0
OUTNB	8	29 SVR
OUTNB	9	28 DIAG
OUTNA	10	27 SGND
OUTNA	11	26 VDDS
PVCCA	12	25 SYNCLK
PVCCA	13	24 ROSC
PGNDA	14	23 INNA
PGNDA	15	22 INPA
OUTPA	16	21 MUTE
OUTPA	17	20 STBY
PGND	18	19 VDDPW

EP
exposed pad down
Connect to ground
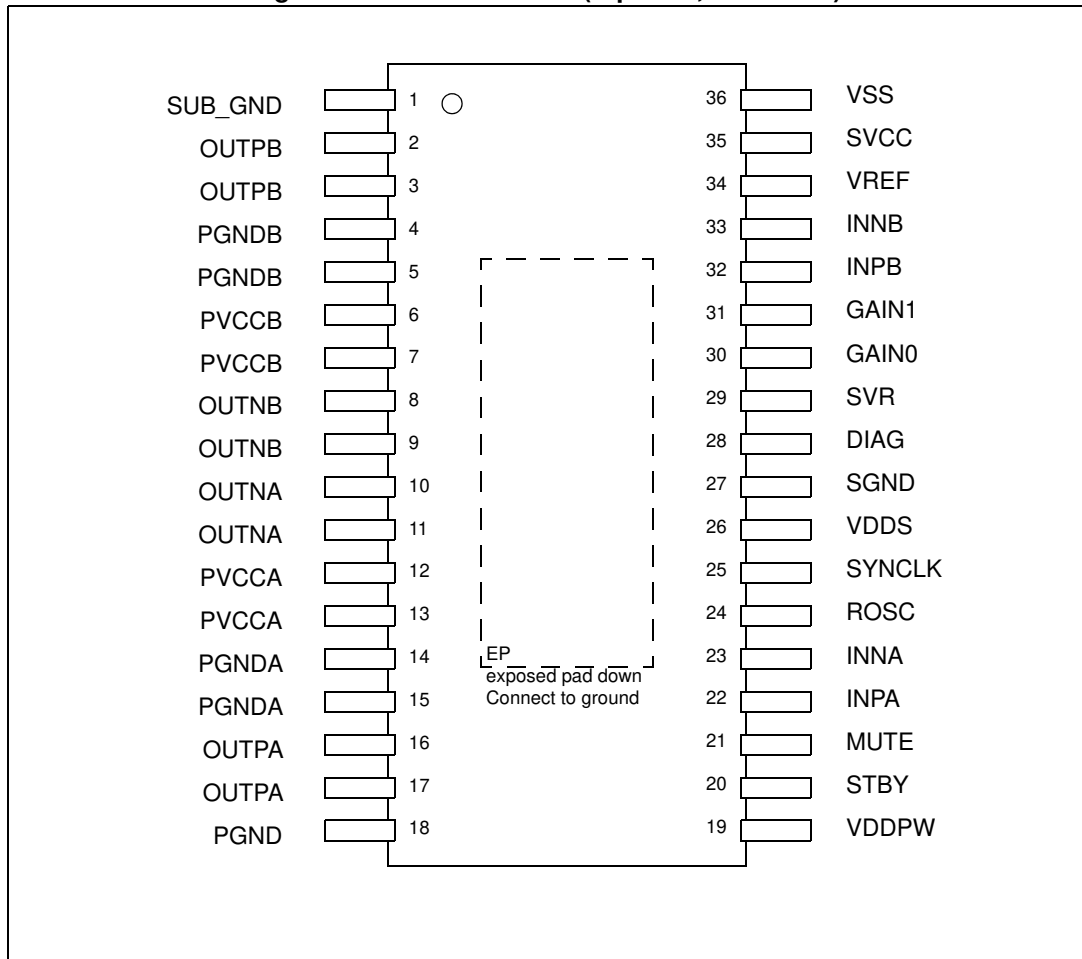
2.2 Pin list

Table 2. Pin description list

Pin n°	Name	Type	Description
1	SUB_GND	POWER	Connect to the frame
2,3	OUTPB	OUT	Positive PWM for right channel
4,5	PGNDB	POWER	Power stage ground for right channel
6,7	PVCCB	POWER	Power supply for right channel
8,9	OUTNB	OUT	Negative PWM output for right channel
10,11	OUTNA	OUT	Negative PWM output for left channel
12,13	PVCCA	POWER	Power supply for left channel
14,15	PGNDA	POWER	Power stage ground for left channel
16,17	OUTPA	OUT	Positive PWM output for left channel
18	PGND	POWER	Power stage ground
19	VDDPW	OUT	3.3-V (nominal) regulator output referred to ground for power stage
20	STBY	INPUT	Standby mode control
21	MUTE	INPUT	Mute mode control
22	INPA	INPUT	Positive differential input of left channel
23	INNA	INPUT	Negative differential input of left channel
24	ROSC	OUT	Master oscillator frequency-setting pin
25	SYNCLCK	IN/OUT	Clock in/out for external oscillator
26	VDDS	OUT	3.3-V (nominal) regulator output referred to ground for signal blocks
27	SGND	POWER	Signal ground
28	DIAG	OUT	Open-drain diagnostic output
29	SVR	OUT	Supply voltage rejection
30	GAIN0	INPUT	Gain setting input 1
31	GAIN1	INPUT	Gain setting input 2
32	INPB	INPUT	Positive differential input of right channel
33	INNB	INPUT	Negative differential input of right channel
34	VREF	OUT	Half VDDS (nominal) referred to ground
35	SVCC	POWER	Signal power supply
36	VSS	OUT	3.3-V (nominal) regulator output referred to power supply
-	EP	-	Exposed pad for ground-plane heatsink, to be connected to GND

3 Electrical specifications

3.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	DC supply voltage for pins PVCCA, PVCCB	23	V
Vi	Voltage limits for input pins STBY,MUTE,INNA,INPA,INNB INPB,GAIN0,GAIN1	-0.3 TO 3.6	V
T_{op}	Operating temperature	-40 to 85	°C
T_j	Junction temperature	-40 to 150	°C
T_{stg}	Storage temperature	-40 to 150	°C

3.2 Thermal data

Refer also to *Section 7.9: Heatsink requirements on page 40*.

Table 4. Thermal data

Symbol	Parameter	Min	Typ	Max	Unit
$R_{th\ j-case}$	Thermal resistance, junction to case	-	2	3	°C/W
$R_{th\ j-amb}$	Thermal resistance, junction to ambient (mounted on recommended PCB)[1]	-	24	-	

1. FR4 with vias to copper area of 9 cm^2.

3.3 Electrical specifications

Unless otherwise stated, the results in *Table 5* below are given for the conditions:
V_{CC} = 18 V, R_L (load) = 8 Ω, R_{OSC} = R3 = 39 kΩ, C8 = 100 nF, f = 1 kHz, G_V = 20 dB, and T_{amb} = 25 °C.

Table 5. Electrical specifications

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{CC}	Supply voltage	-	5	-	18	V
I_q	Total quiescent current	-	-	26	35	mA
I_{qSTBY}	Quiescent current in standby	-	-	2.5	5.0	µA
V_{OS}	Output offset voltage	Play mode	-100	-	100	mV
		Mute mode	-60	-	60	mV
I_{OCP}	Overcurrent protection threshold	R_L = 0 Ω	3	5	-	A
T_j	Junction temperature at thermal shutdown	-	-	150	-	°C
R_i	Input resistance	Differential input	54	60	-	kΩ

Table 5. Electrical specifications (continued)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{UVP}	Undervoltage protection threshold	-	-	-	4.5	V
R_{dsON}	Power transistor on resistance	High side	-	0.2	-	Ω
		Low side	-	0.2	-	
P_o	Output power	THD = 10%	-	20	-	W
		THD = 1%	-	16	-	
P_o	Output power	$R_L = 8\ \Omega$, THD = 10% $V_{CC} = 12$ V	-	9.5	-	W
		$R_L = 8\ \Omega$, THD = 1% $V_{CC} = 12$ V	-	7.2	-	
P_D	Dissipated power	$P_o = 20$ W +20 W, THD = 10%	-	4.0	-	W
η	Efficiency	$P_o = 20$ W + 20 W	80	90	-	%
THD	Total harmonic distortion	$P_o = 1$ W	-	0.1		%
G_V	Closed loop gain	GAIN0 = L, GAIN1 = L	18	20	22	dB
		GAIN0 = L, GAIN1 = H	24	26	28	
		GAIN0 = H, GAIN1 = L	28	30	32	
		GAIN0 = H, GAIN1 = H	30	32	34	
ΔG_V	Gain matching	-	-1	-	1	dB
CT	Cross talk	f = 1 kHz, Po= 1W	-	70	-	dB
eN	Total input noise	A Curve, $G_V = 20$ dB	-	15	-	μV
		f = 22 Hz to 22 kHz	-	20		
SVRR	Supply voltage rejection ratio	fr = 100 Hz, Vr =1Vpp, $C_{SVR} = 10$ μF		50	-	dB
T_r, T_f	Rise and fall times	-	-	40	-	ns
f_{SW}	Switching frequency	Internal oscillator, master mode	290	320	350	kHz
f_{SWR}	Switching frequency range	[1]	250	-	400	kHz
V_{inH}	Digital input high (H)	-	2.3	-	-	V
V_{inL}	Digital input low (L)		-	-	0.8	
A_{MUTE}	Mute attenuation	V_{MUTE} = low V_{STBY} = high		80	-	dB
Function mode	Standby, mute and play modes	$V_{STBY} < 0.5$ V V_{MUTE} = X	Standby			-
		$V_{STBY} > 2.9$ V, $V_{MUTE} < 0.8$ V	Mute			-
		$V_{STBY} > 2.9$ V, $V_{MUTE} > 2.9$ V	Play			-

1. Refer to *Section 7.4: Internal and external clocks on page 36*.

4 Characterization curves

The following characterization curves were made using the TDA7491HV demo board. The LC filter for the 4-Ω load uses components of 15 µH and 470 nF, whilst that for the 6-Ω load uses 22 µH and 220 nF and that for the 8-Ω load uses 33 µH and 220 nF.

4.1 With 4 Ω load at V_{CC} = 14 V

Figure 3. Output power vs. supply voltage

Test Condition :
Vcc = 5~14V,
RL = 4 ohm,
Rosc = 39kΩ, Cosc =100nF,
f =1kHz,
Gv = 30dB,
Tamb = 25℃

Specification Limit:
Typical:
Vs =14V,Rl = 4 ohm
Po = 20W @THD =10%
Po =16W @THD =1%
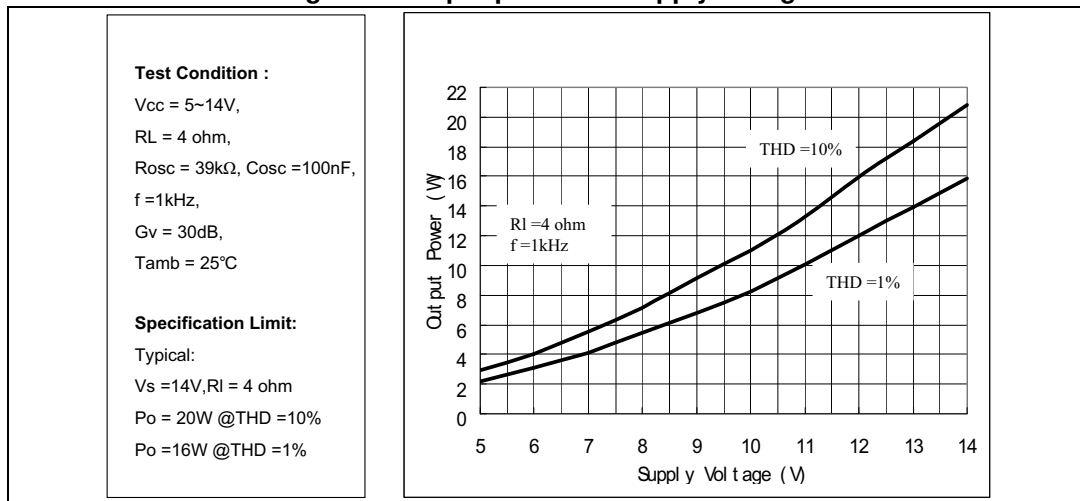
Figure 4. THD vs. output power (1 kHz)

Test Condition:
Vcc=14V,
RL=4 ohm,
Rosc=39kΩ, Cosc=100nF,
f =1kHz,
Gv=30dB,
Tamb=25℃

Specification Limit:
Typical:
Po=20W @ THD=10%
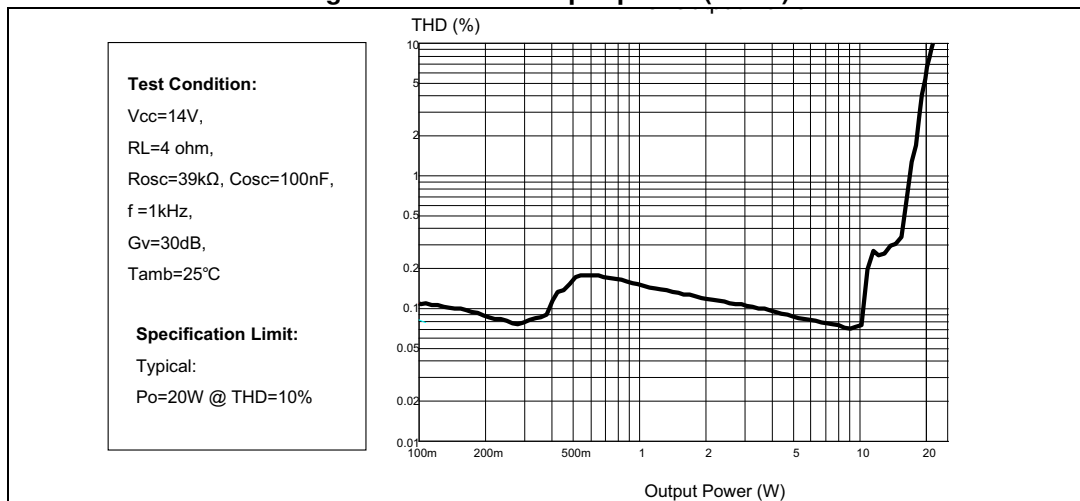
Figure 5. THD vs. output power (100 Hz)

Test Condition:

Vcc=14V,

RL=4 ohm,

Rosc=39kΩ, Cosc=100nF,

f =100Hz,

Gv=30dB,

Tamb=25°C

Specification Limit:

Typical:

20W @ THD=10%

THD (%)
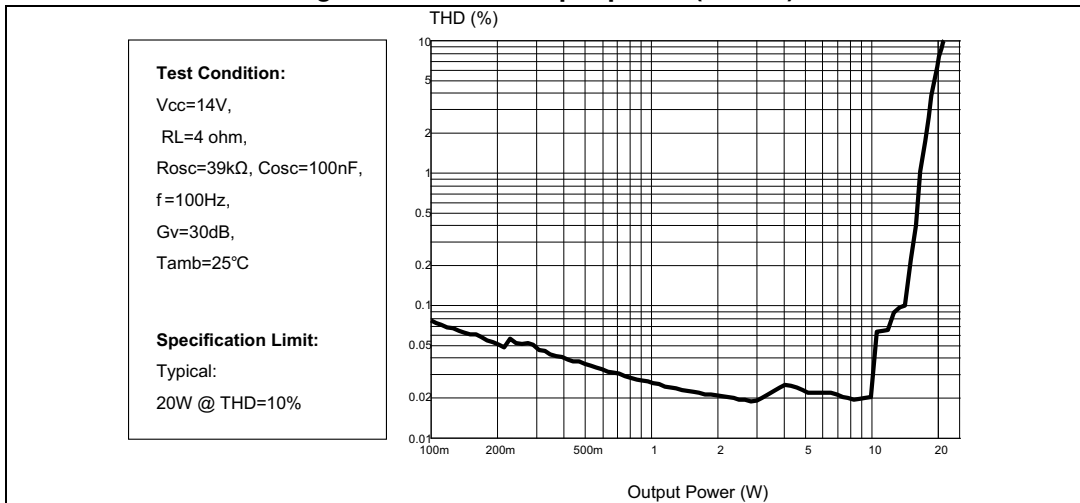
Output Power (W)

Figure 6. THD vs. frequency

Test Condition:

Vcc=14V,

RL=4 ohm,

Rosc=39kΩ, Cosc=100nF,

f = 1kHz,

Gv=30dB,

Po=1W

Tamb=25°C

Specification Limit:

Typical: THD <0.5%

THD (%)
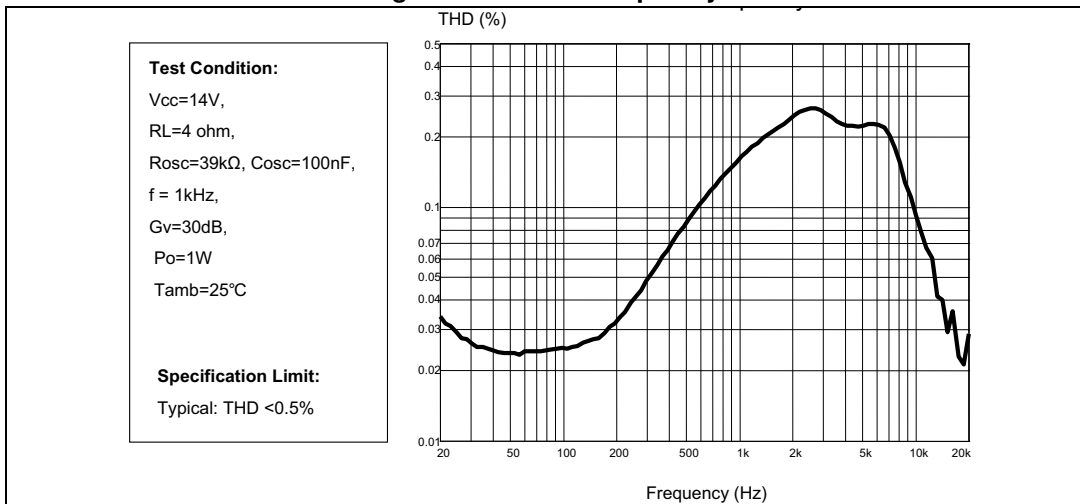
Frequency (Hz)

Figure 7. Frequency response

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc=39kΩ, Cosc=100nF,

f = 1kHz,

Gv = 30dB,

Po =1W

Tamb = 25°C

Specification Limit:

Max: +/-3dB

@20Hz to 20kHz

Ampl (dB)
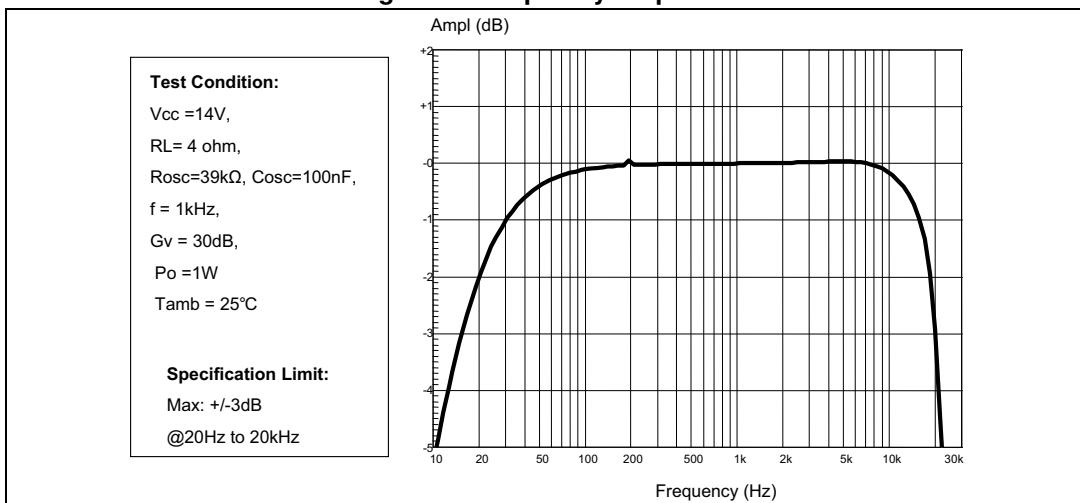
Frequency (Hz)

Figure 8. Crosstalk vs. frequency

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc= 39kΩ, Cosc = 100nF,

f = 1kHz,

Gv = 30dB,

Po = 1W

Tamb = 25℃

Specification Limit:

Typical: >50dB (@ f = 1kHz)

Figure 9. FFT (0 dB)

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc =100nF,

f =1kHz,

Gv = 30dB,

Po = 1W

Tamb = 25℃

Specification Limit:

Typical: >60dB

for the harmonic   frequency

Figure 10. FFT (-60 dB)

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

f = 1kHz,

Gv=30dB,

Po= -60dB (@ 1W =0dB)

Tamb=25℃

Specification Limit:

Typical: > 90dB

for the harmonic   frequency
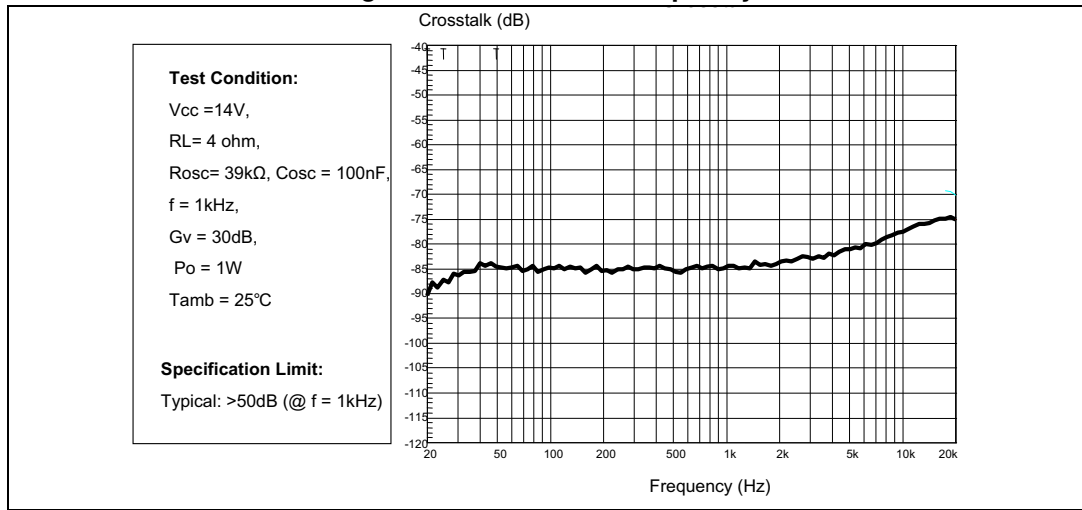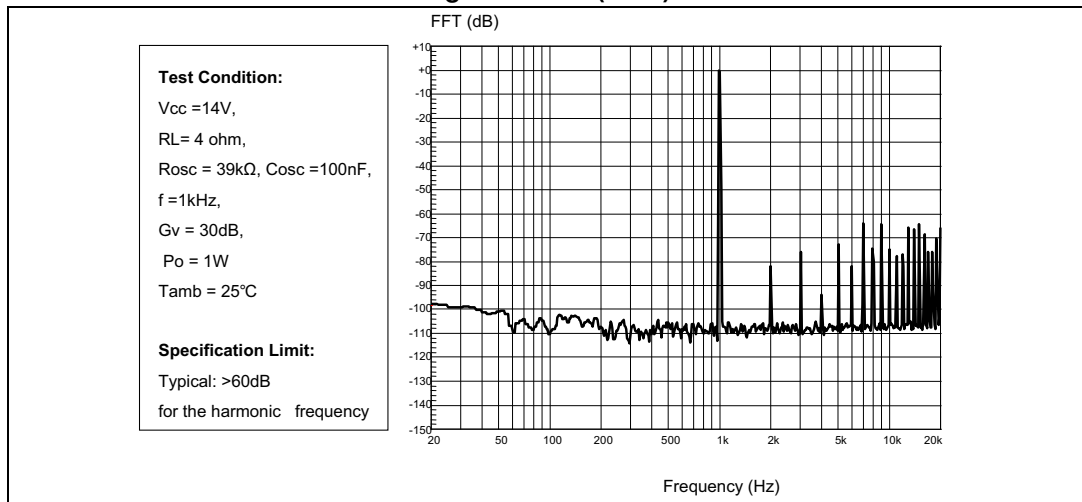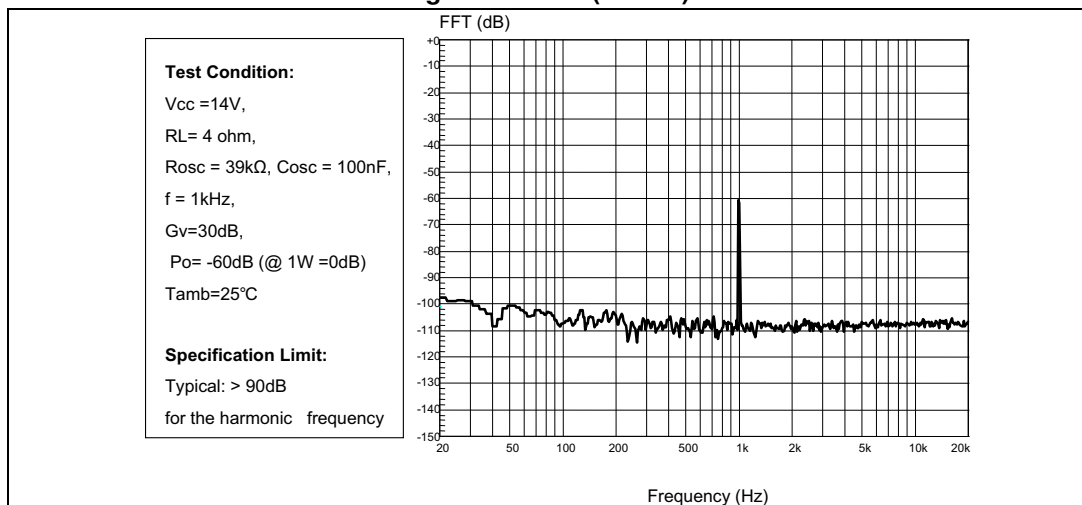
Figure 11. Power supply rejection ratio vs. frequency

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

Vin=0,

Gv=30dB,

0dB refers to 500mV,100Hz

Tamb=25℃

Ripple frequency=100Hz

Ripple voltage=500mV
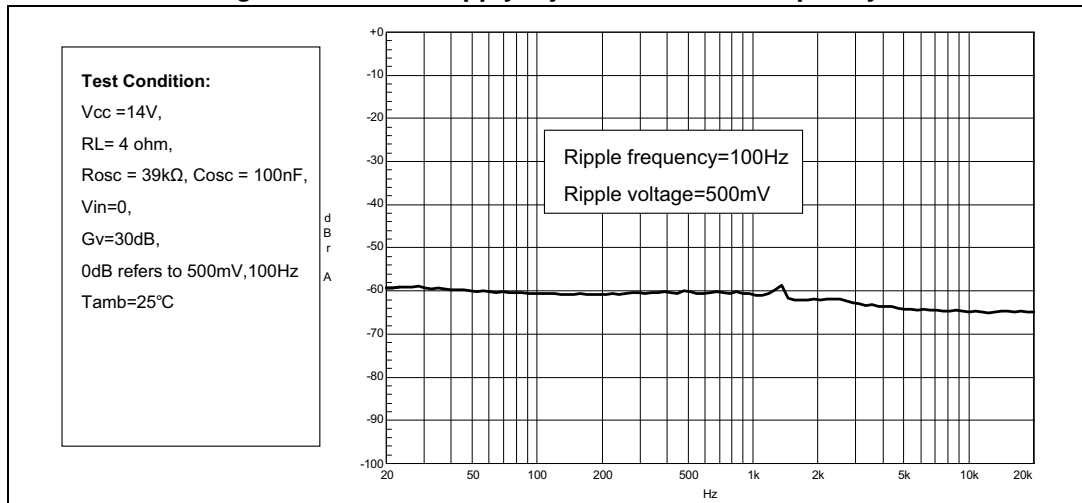
Figure 12. Power dissipation and efficiency vs. output power

Test Condition:

Vcc=14V,

RL=4 ohm,

Rosc=39kΩ, Cosc=100nF,

f =1kHz,

Gv=30dB,

Tamb=25℃

Vcc=14V
Rload=4ohm
Gain=30dB
f=1kHz
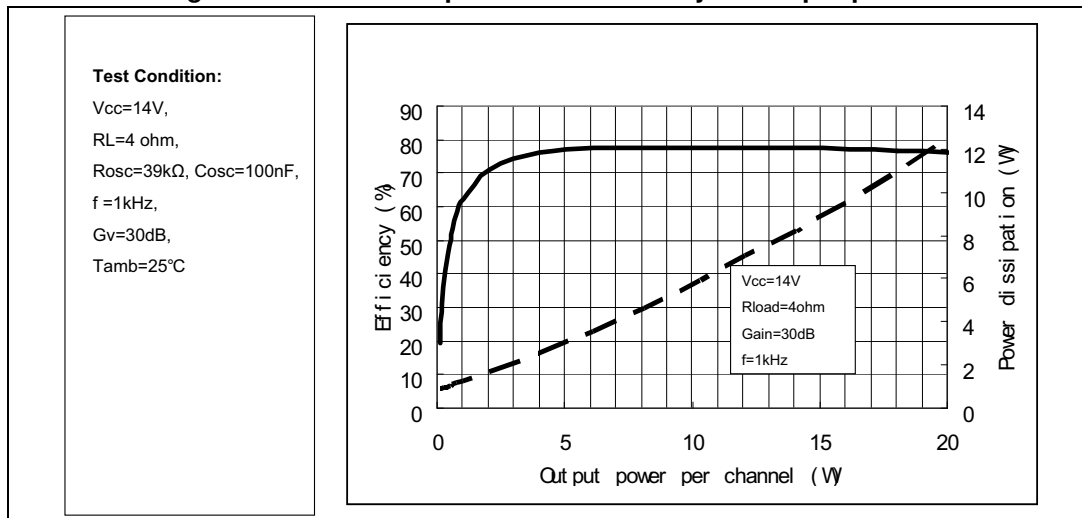
Figure 13. Closed-loop gain vs. frequency

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

F=1kHz,

0dB@f=1kHz,,Po=1w,
Gain=32dB

Tamb=25℃

Gain=32dB

Gain=26dB

Gain=22dB

Gain=32dB
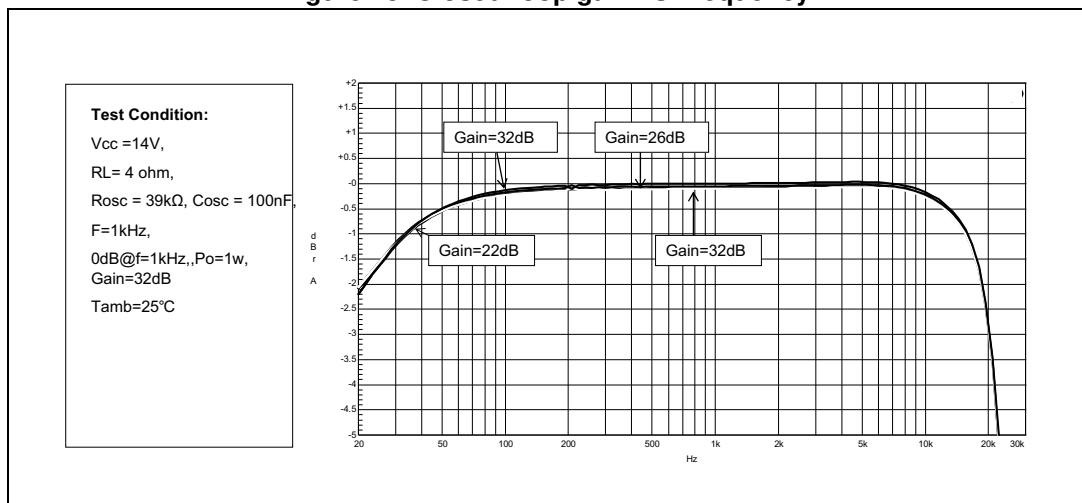
Figure 14. Current consumption vs. voltage on pin MUTE

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

Vin=0,

Tamb=25℃
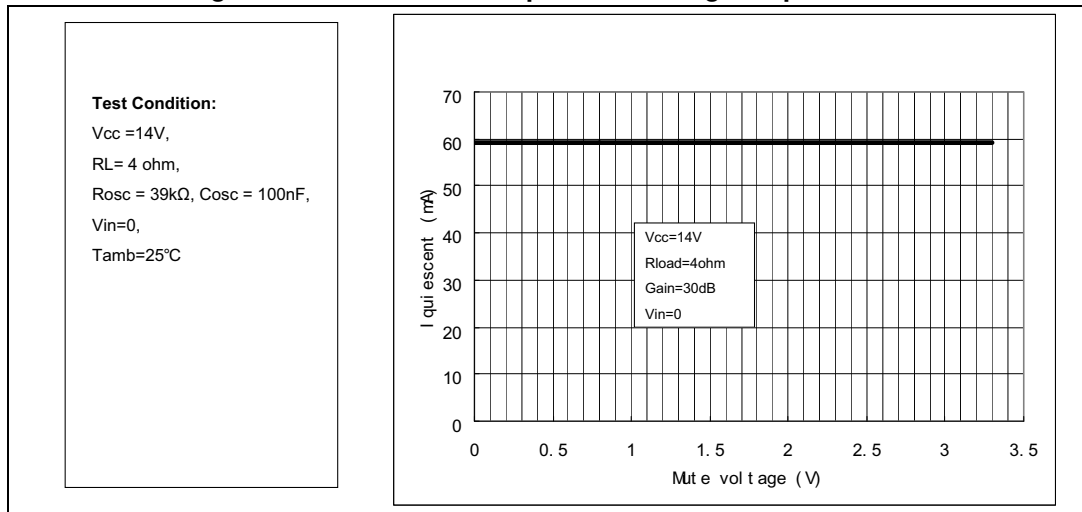
Figure 15. Attenuation vs. voltage on pin MUTE

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

0dB@f=1kHz, Po=1w,
Gain=30dB,

Tamb=25℃
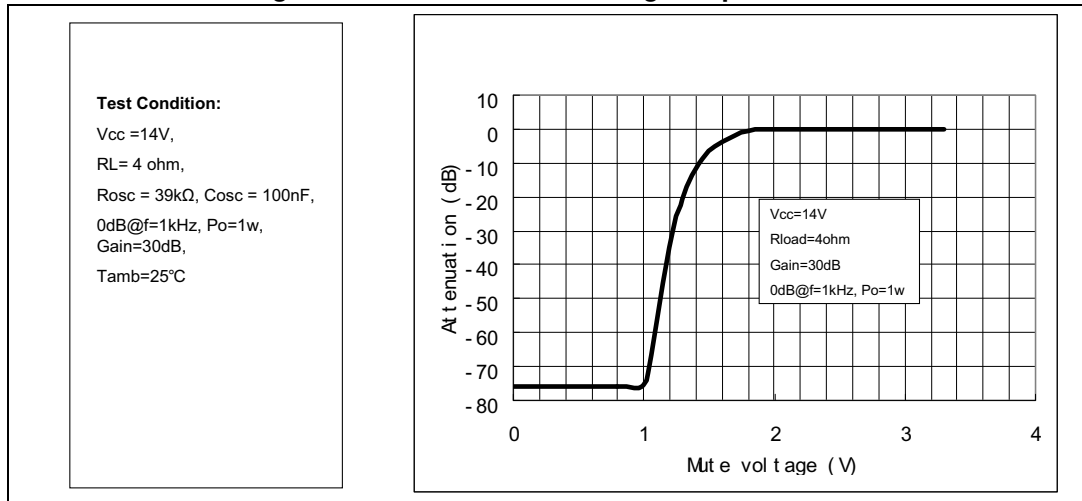
Figure 16. Current consumption vs. voltage on pin STBY

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

Vin=0,

Tamb=25℃
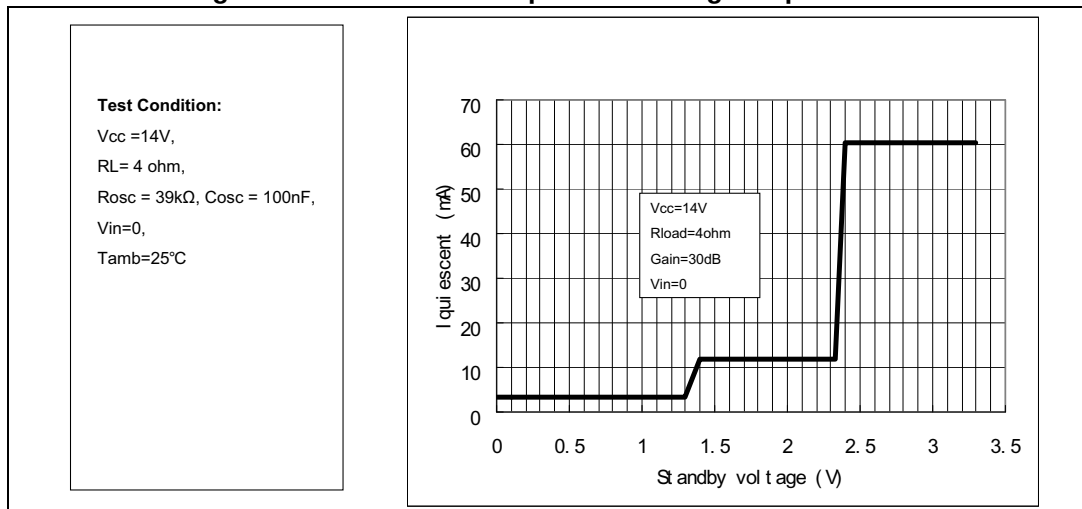
Figure 17. Attenuation vs. voltage on pin STBY

Test Condition:

Vcc =14V,

RL= 4 ohm,

Rosc = 39kΩ, Cosc = 100nF,

0dB@f=1kHz,Po=1w,
Gain=30dB.

Tamb=25℃

Vcc=14V
Rload=4ohm
Gain=30dB
0dB@f=1kHz, Po=1w
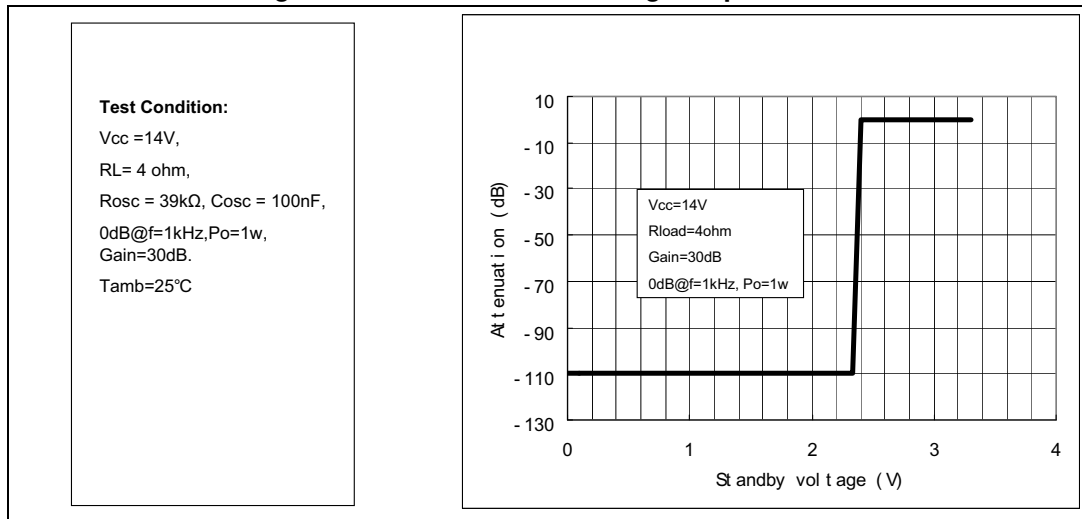
4.2 With 6 Ω load at V$_{CC}$ = 16 V

Figure 18. Output power vs. supply voltage

Test Condition :

Vcc = 5~16V,

RL = 6 ohm,

Rosc = 39kΩ, Cosc = 100nF,

f =1kHz,

Gv = 30dB,

Tamb = 25℃

Specification Limit:

Typical:

Vs =16V,Rl =6 ohm

Po=20W @THD=10%

Po=16W @THD=1%

Rl =6 ohm
f =1kHz

THD =10%

THD =1%
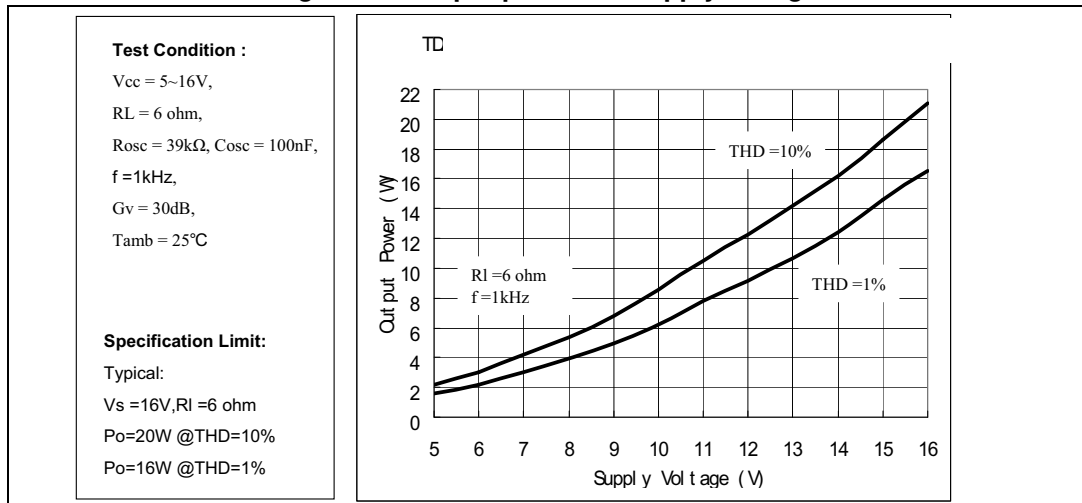
Figure 19. THD vs. output power (1 kHz)

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

Tamb =25℃

Specification Limit:

Typical:

Po=20W @ THD=10%

THD (%)
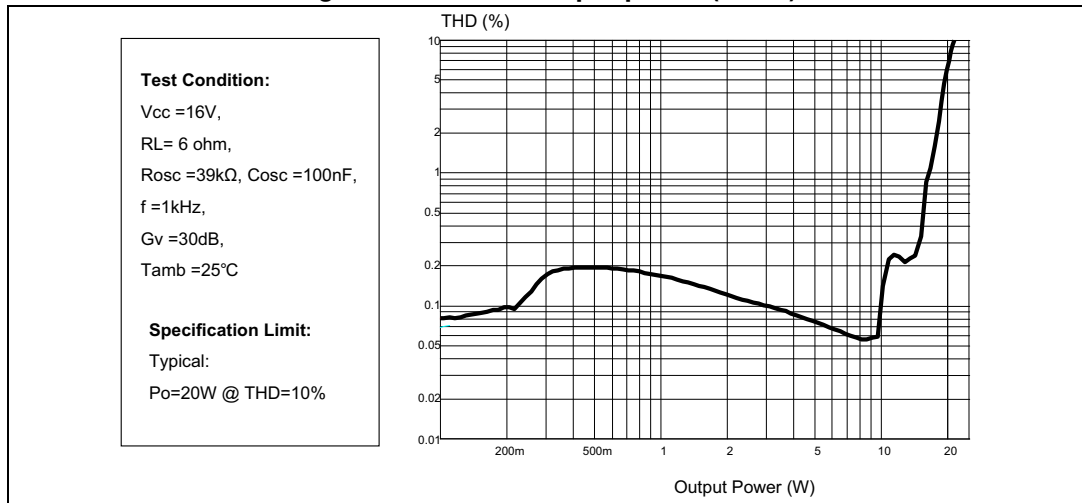
Output Power (W)

Figure 20. THD vs. output power (100 Hz)

Test Condition:

Vcc =16V,

 RL = 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f =100Hz,

Gv =30dB,

Tamb =25℃

Specification Limit:

Typical:

20W @ THD =10%

THD (%)
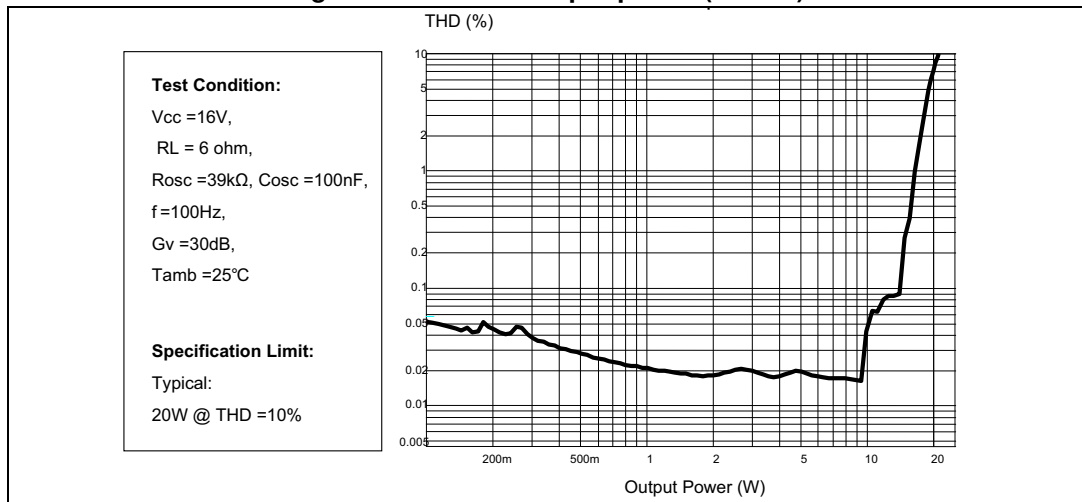
Output Power (W)

Figure 21. THD vs. frequency

Test Condition:

Vcc =16V,

RL= 6 ohm,

Ros c=39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

Po =1W

Tamb =25℃

Specification Limit:

Typical: THD<0.5%

THD (%)
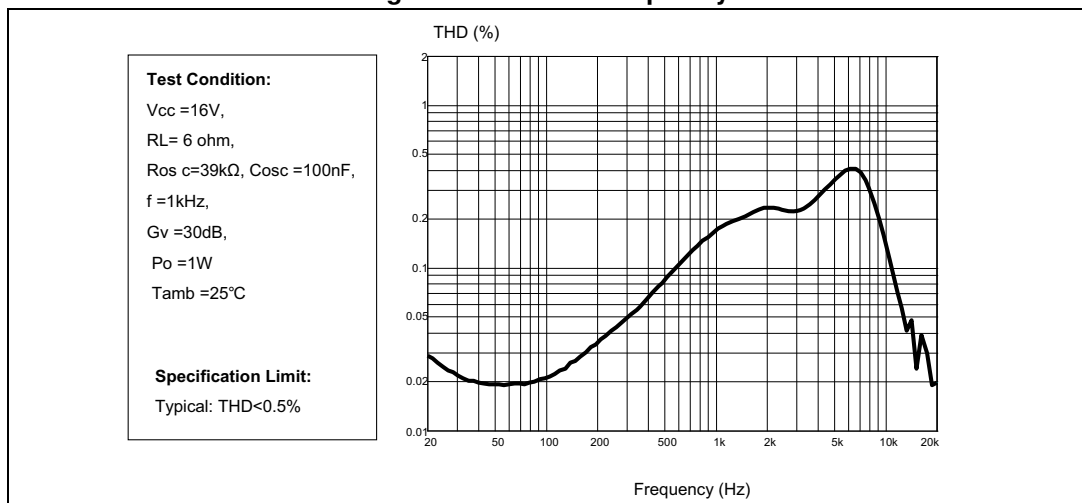
Frequency (Hz)

Figure 22. Frequency response

Test Condition:

Vcc=16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f = 1kHz,

Gv =30dB,

 Po =1W

 Tamb =25℃

 Specification Limit:

 Max: +/-3dB

 @20Hz to 20kHz
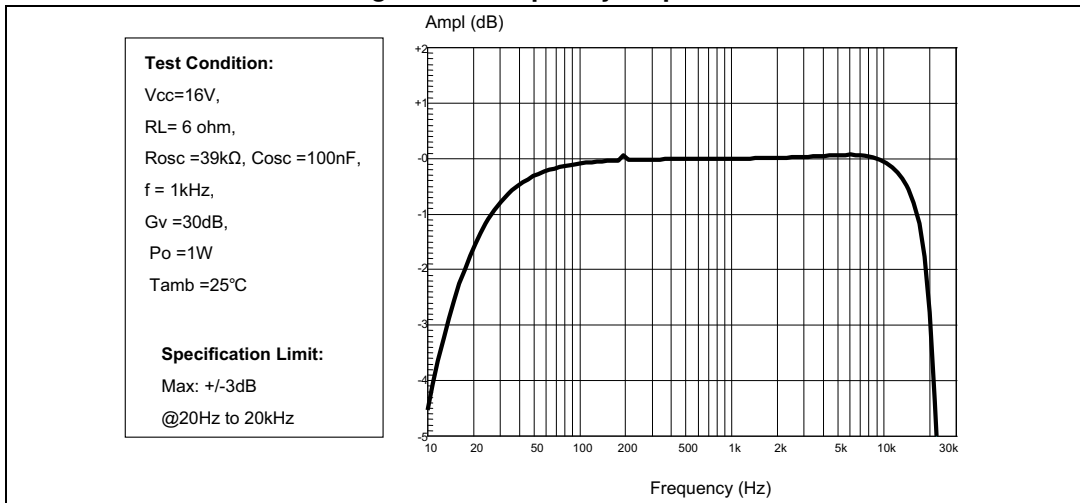
Figure 23. Crosstalk vs. frequency

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f = 1kHz,

Gv =30dB,

 Po =1W

Tamb=25℃

Specification Limit:

Typical: >50dB (@ f =1kHz)

Figure 24. FFT (0 dB)

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

 Po =1W

 Tamb =25℃

Specification Limit:

Typical: >60dB

for the harmonic   frequency

Figure 25. FFT (-60 dB)

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

 Po = -60dB (@ 1W =0dB)

Tamb =25℃

Specification Limit:

Typical: > 90dB

for the harmonic   frequency
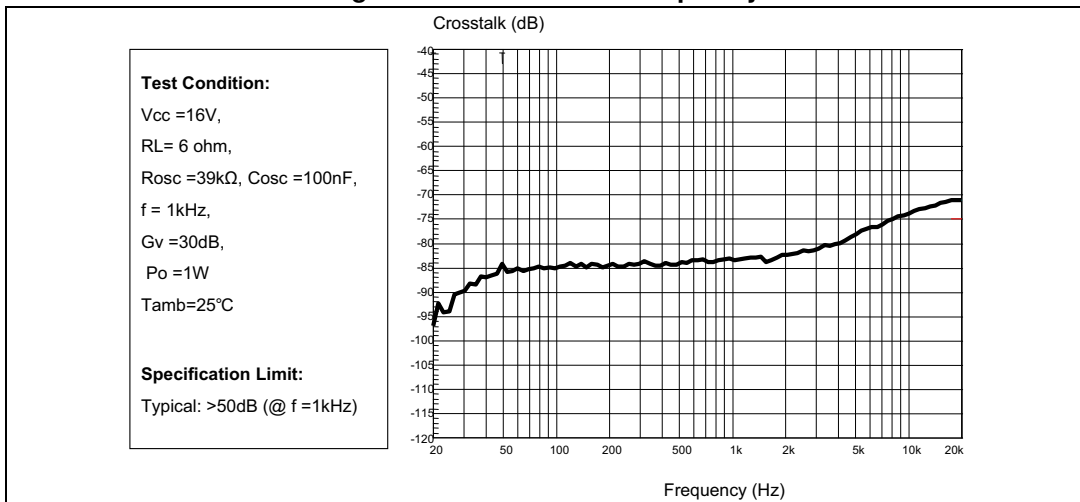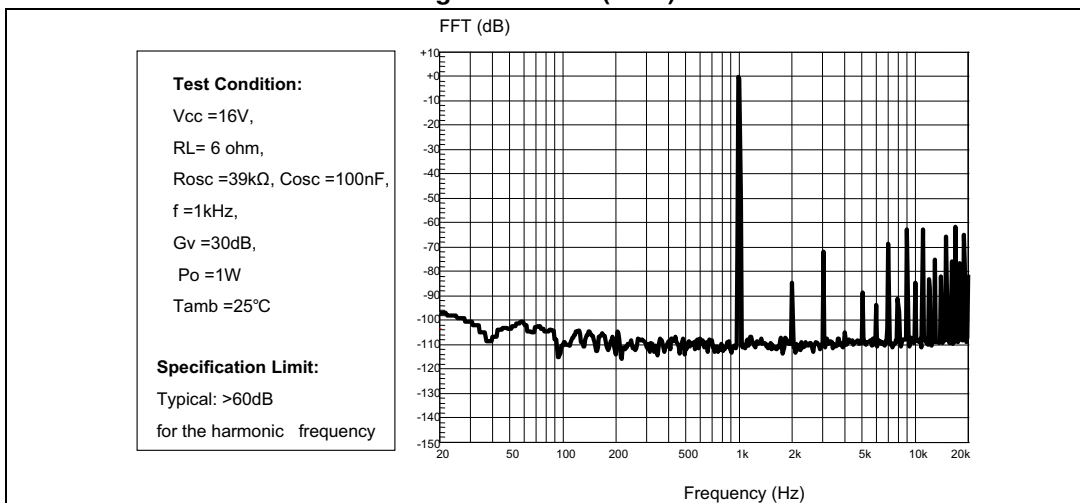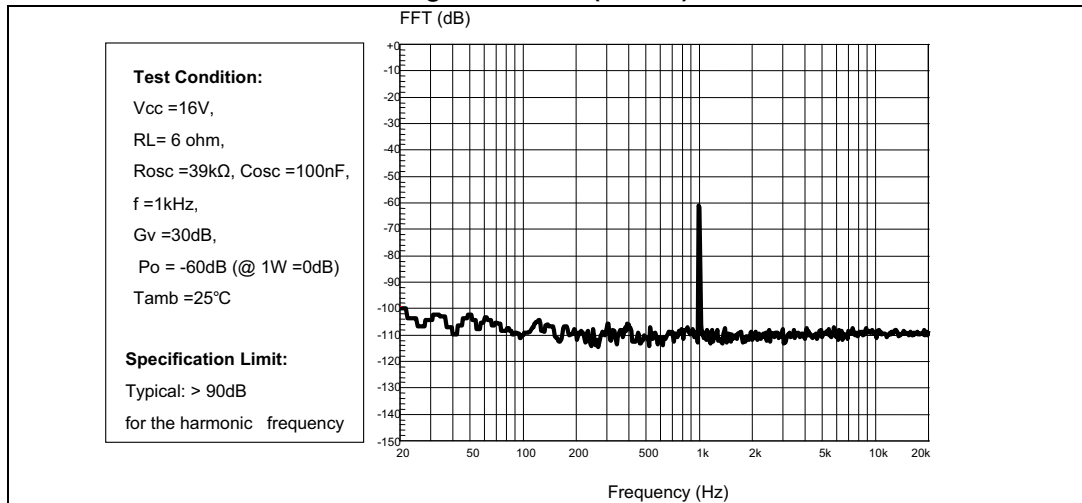
Figure 26. Power supply rejection ratio vs. frequency

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

Vin=0,

Gv =30dB,

Tamb =25℃,

0dB refers to 500mV, 100Hz

Ripple frequency=100Hz

Ripple voltage=500mV
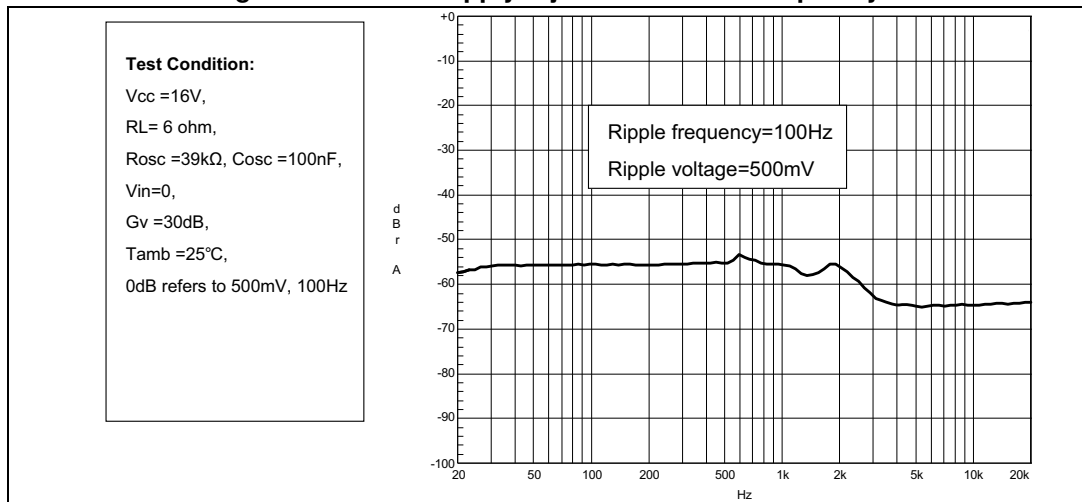
Figure 27. Power dissipation and efficiency vs. output power

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

Tamb =25℃

Vcc=16V

Rload=6ohm

Gain=30dB

f=1kHz
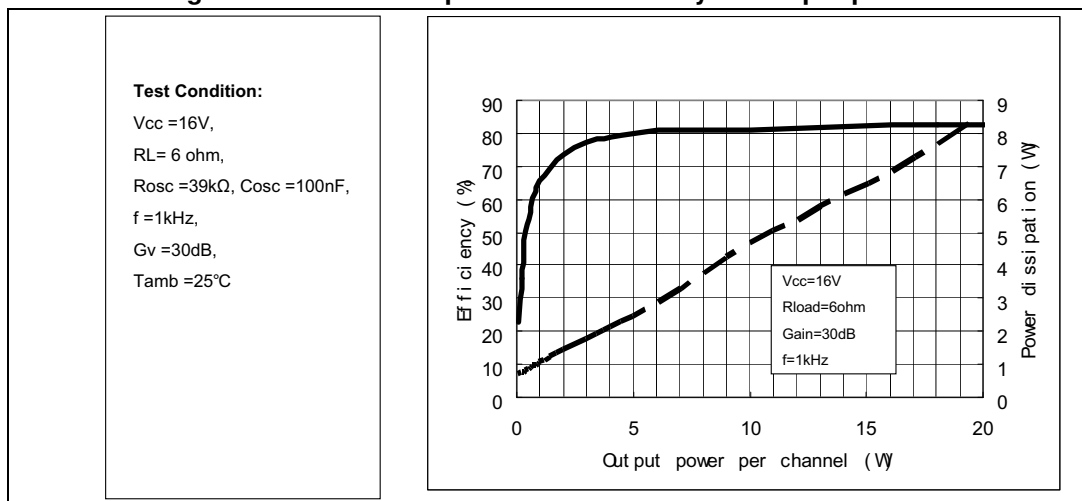
Figure 28. Closed-loop gain vs. frequency

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

0dB@f=1kHz,Po=1w,
Gv=32dB,

Tamb =25℃
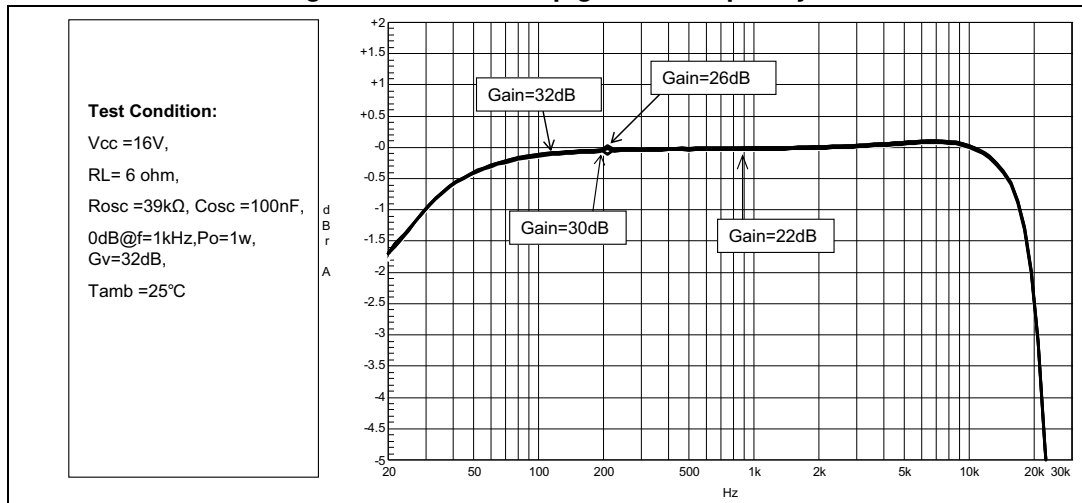
Figure 29. Current consumption vs. voltage on pin MUTE

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

Vin=0,

Gain=30dB,

Tamb =25℃
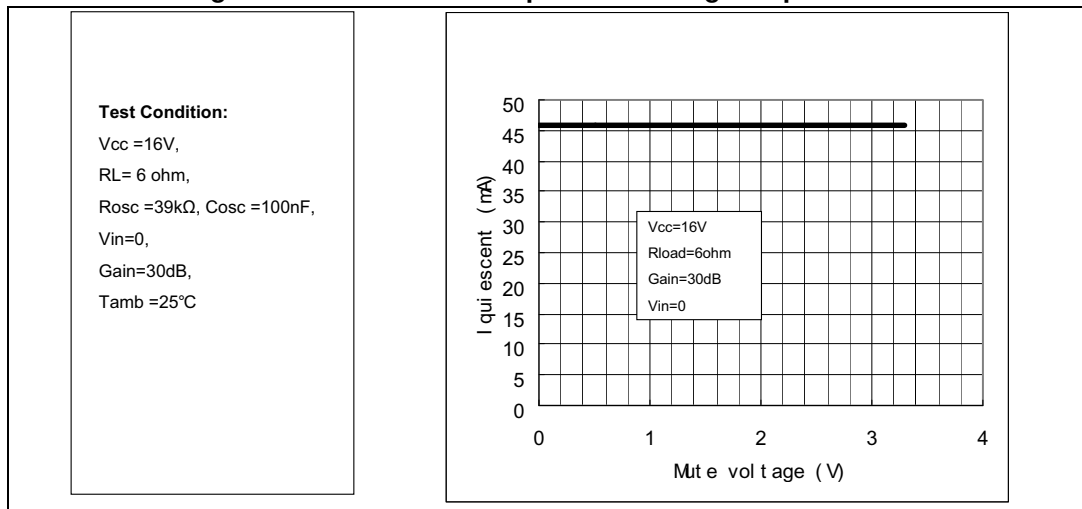
Figure 30. Attenuation vs. voltage on pin MUTE

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

0dB@f=1kHz,Po=1w,
Gain=30dB,

Tamb =25℃
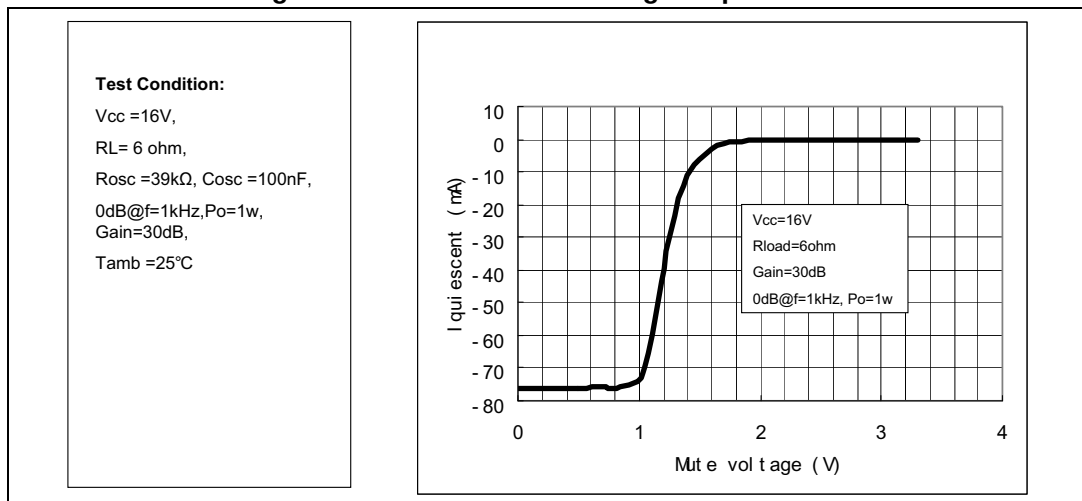
Figure 31. Current consumption vs. voltage on pin STBY

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

Vin=0,

Gain=30dB,

Tamb =25℃
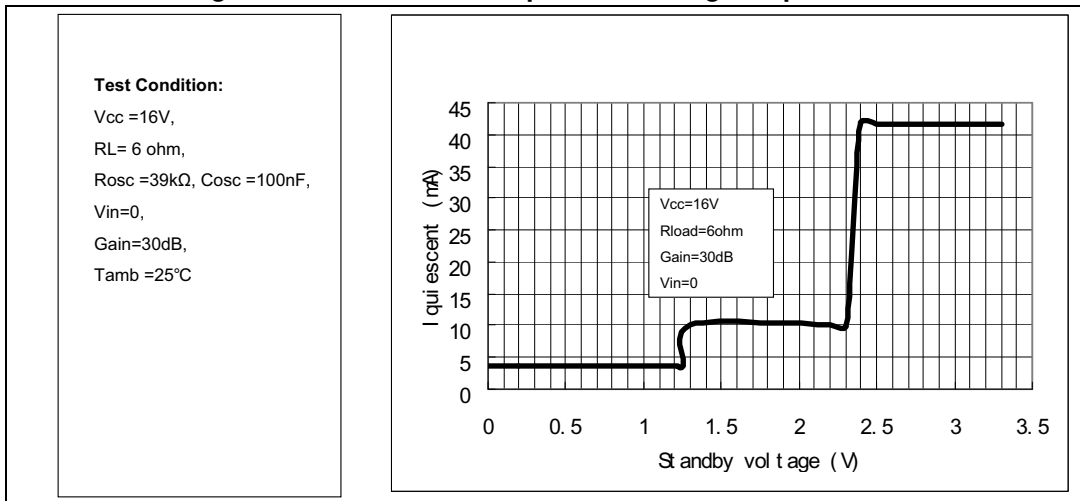
Figure 32. Attenuation vs. voltage on pin STBY

Test Condition:

Vcc =16V,

RL= 6 ohm,

Rosc =39kΩ, Cosc =100nF,

0dB@f=1kHz,Po=1w,
Gain=30dB,

Tamb =25℃
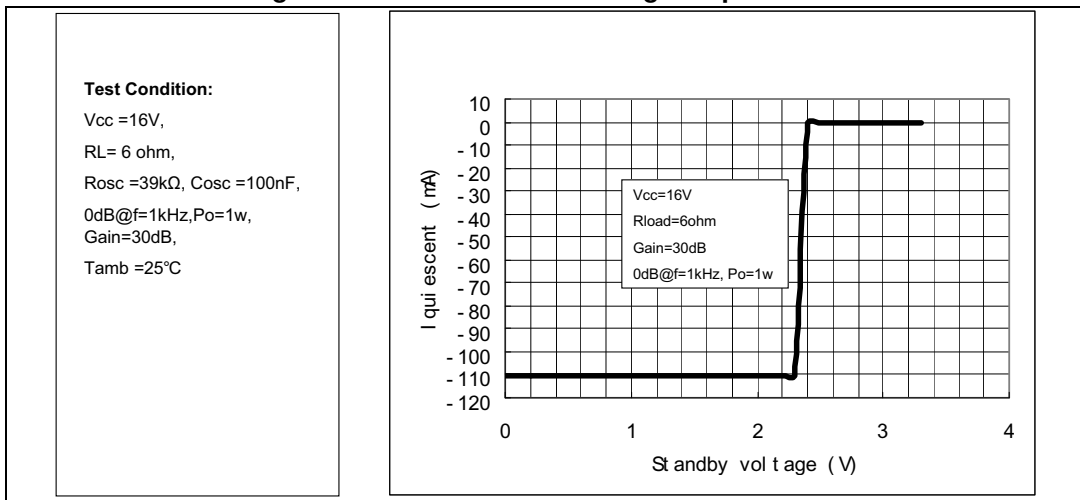
4.3 With 8 Ω load at V_CC = 18 V

Figure 33. Output power vs. supply voltage

Test Condition :

Vcc = 5~18V,

RL = 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

Tamb =25℃

Specification Limit:

Typical:

Vs =18V,Rl = 8 ohm

Po =20W @THD =10%

Po =16W @THD =1%
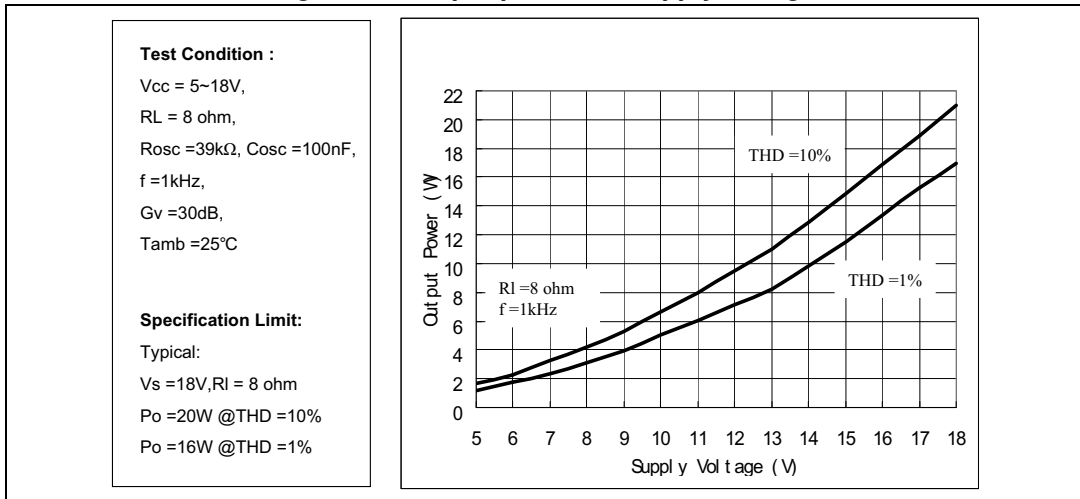
Figure 34. THD vs. output power (1 kHz)

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

Tamb =25℃

Specification Limit:

Typical:

Po =20W @ THD =10%
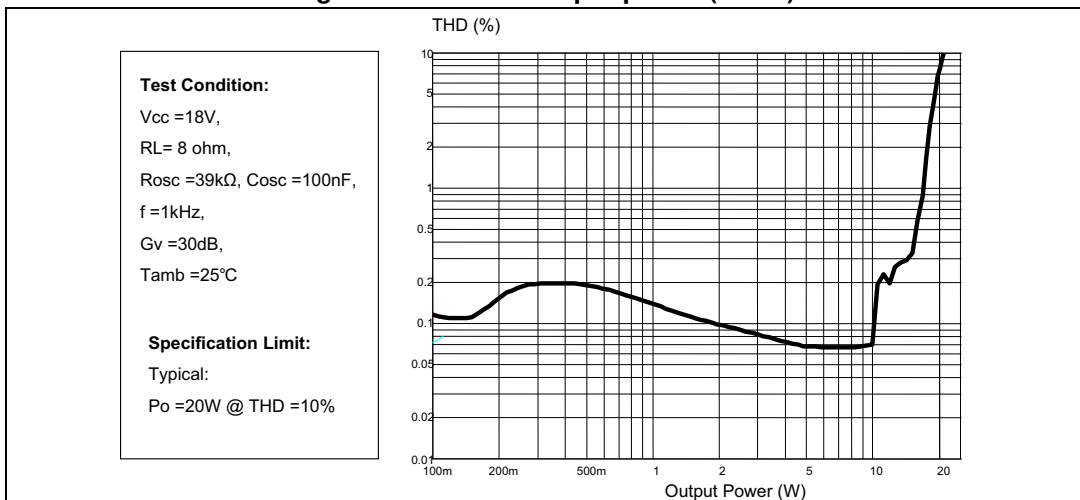
Figure 35. THD vs. output power (100 Hz)

Test Condition:

Vcc =18V,

 RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =100Hz,

Gv =30dB,

Tamb =25℃

Specification Limit:

Typical:

20W @ THD =10%

THD (%)

Output Power (W)
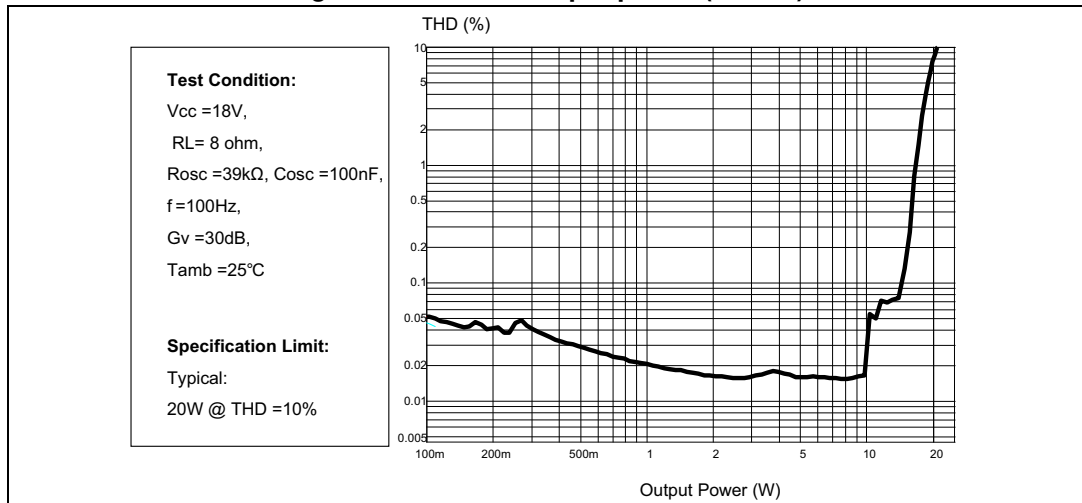
Figure 36. THD vs. frequency

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

 Po =1W

 Tamb =25℃

Specification Limit:

Typical: THD<0.5%

THD (%)
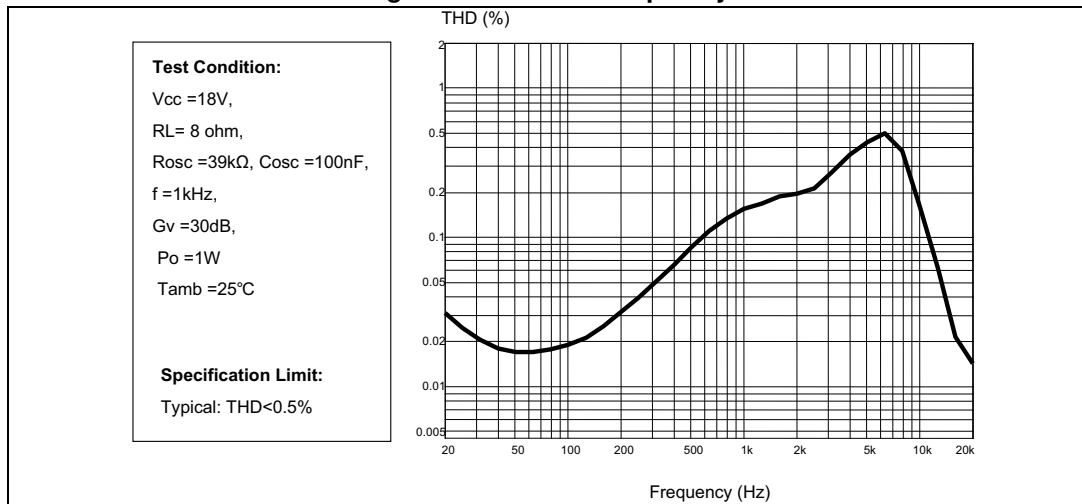
Frequency (Hz)

Figure 37. Frequency response

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv =30dB,

 Po =1W

 Tamb =25℃

Specification Limit:

Max: +/-3dB

@20Hz to 20kHz

Ampl (dB)
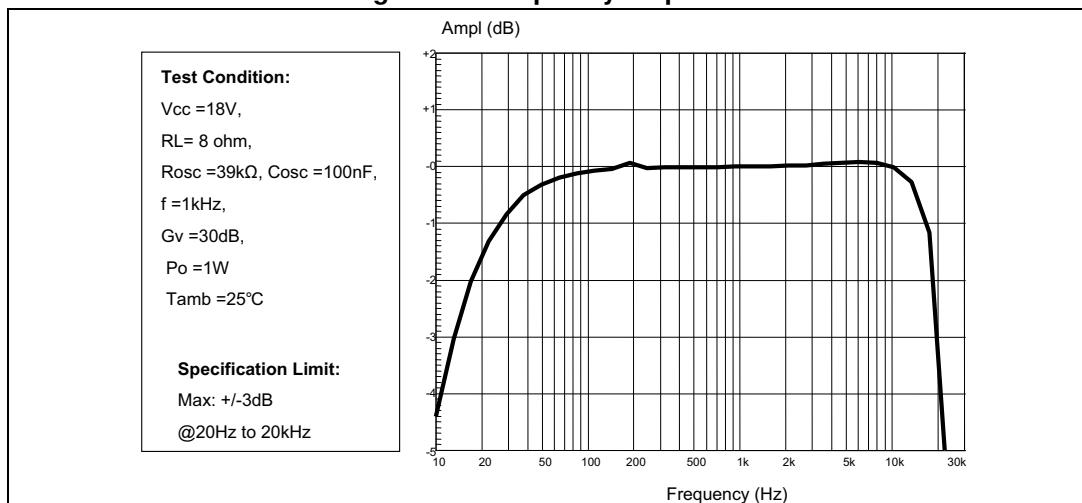
Frequency (Hz)

Figure 38. Crosstalk vs. frequency

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f = 1kHz,

Gv=30dB,

Po=1W

Tamb=25℃

Specification Limit:

Typical: >50dB (@ f =1kHz)

Figure 39. FFT (0 dB)

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f = 1kHz,

Gv =30dB,

Po =1W

Tamb =25℃

Specification Limit:

Typical: >60dB

for the harmonic   frequency

Figure 40. FFT (-60 dB)

Test Condition:

Vcc =18V,

RL= 8 ohm,

Rosc =39kΩ, Cosc =100nF,

f =1kHz,

Gv=30dB,

Po = -60dB (@ 1W =0dB)

Tamb =25℃

Specification Limit:

Typical: > 90dB

for the harmonic   frequency