



TDA7498E

160-watt + 160-watt dual BTL class-D audio amplifier

Preliminary data

Features

- 160-W + 160-W output power at THD = 10% with $R_L = 4 \Omega$ and $V_{CC} = 36 V$
- 1 x 220 W output power mono parallel BTL at THD = 10% with $R_L = 3 \Omega$ and $V_{CC} = 36 V$
- Wide-range single-supply operation (14 - 36 V)
- High efficiency ($\eta = 85\%$)
- Parallel BTL function using the MODE pin
- Four selectable, fixed gain settings of nominally 23.8 dB, 29.8 dB, 33.3 dB and 35.8 dB
- Differential inputs minimize common-mode noise
- Standby and mute features
- Smart protection
- Thermal overload protection
- Small offset less than 20 mV



Description

The TDA7498E is a dual BTL class-D audio amplifier with a single power supply designed for home systems and active speaker applications.

It comes in a 36-pin PowerSSO package with exposed pad up (EPU) to facilitate mounting a separate heatsink.

Table 1. Device summary

Order code	Operating temp. range	Package	Packaging
TDA7498E	0 to 70 °C	PowerSSO36 (EPU)	Tube
TDA7498ETR	0 to 70 °C	PowerSSO36 (EPU)	Tape and reel

Contents

- 1 Device block diagram 4**
- 2 Pin description 5**
 - 2.1 Pinout 5
 - 2.2 Pin list 6
- 3 Electrical specifications 7**
 - 3.1 Absolute maximum ratings 7
 - 3.2 Thermal data 7
 - 3.3 Recommended operating conditions 7
 - 3.4 Electrical specifications 8
 - 3.5 Test circuit 10
- 4 Characterization curves 11**
 - 4.1 For $R_L = 4 \Omega$, stereo configuration 11
 - 4.2 For $R_L = 3 \Omega$, mono BTL configuration 14
- 5 Application information 16**
 - 5.1 Stereo and mono BTL operation selection using the MODE pin 16
 - 5.2 Gain setting 16
 - 5.3 Smart protection 16
- 6 Package mechanical data 17**
- 7 Revision history 19**

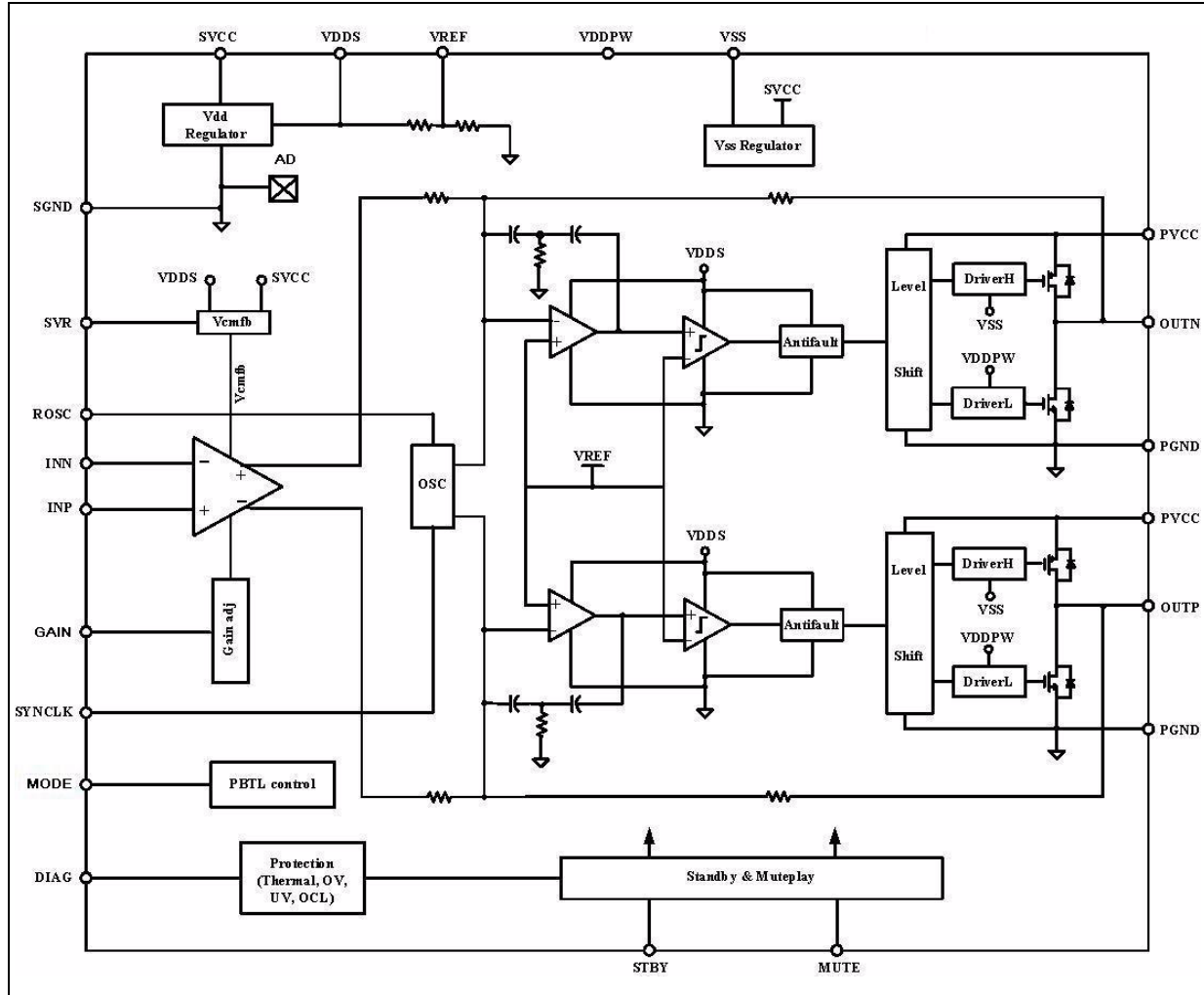
List of figures

Figure 1.	Internal block diagram (showing one channel only)	5
Figure 2.	Pin connections (top view, PCB view)	6
Figure 3.	Test circuit stereo application and mono BTL mode	11
Figure 4.	Output power vs. supply voltage	12
Figure 5.	THD vs. output power	13
Figure 6.	THD vs. frequency	13
Figure 7.	FFT performance	14
Figure 8.	Crosstalk vs. frequency	14
Figure 9.	Output power vs. supply voltage	15
Figure 10.	THD vs. output power	16
Figure 11.	THD vs. frequency	16
Figure 12.	PowerSSO36 EPU outline drawing	19

1 Device block diagram

Figure 1 shows the block diagram of one of the two identical channels of the TDA7498E.

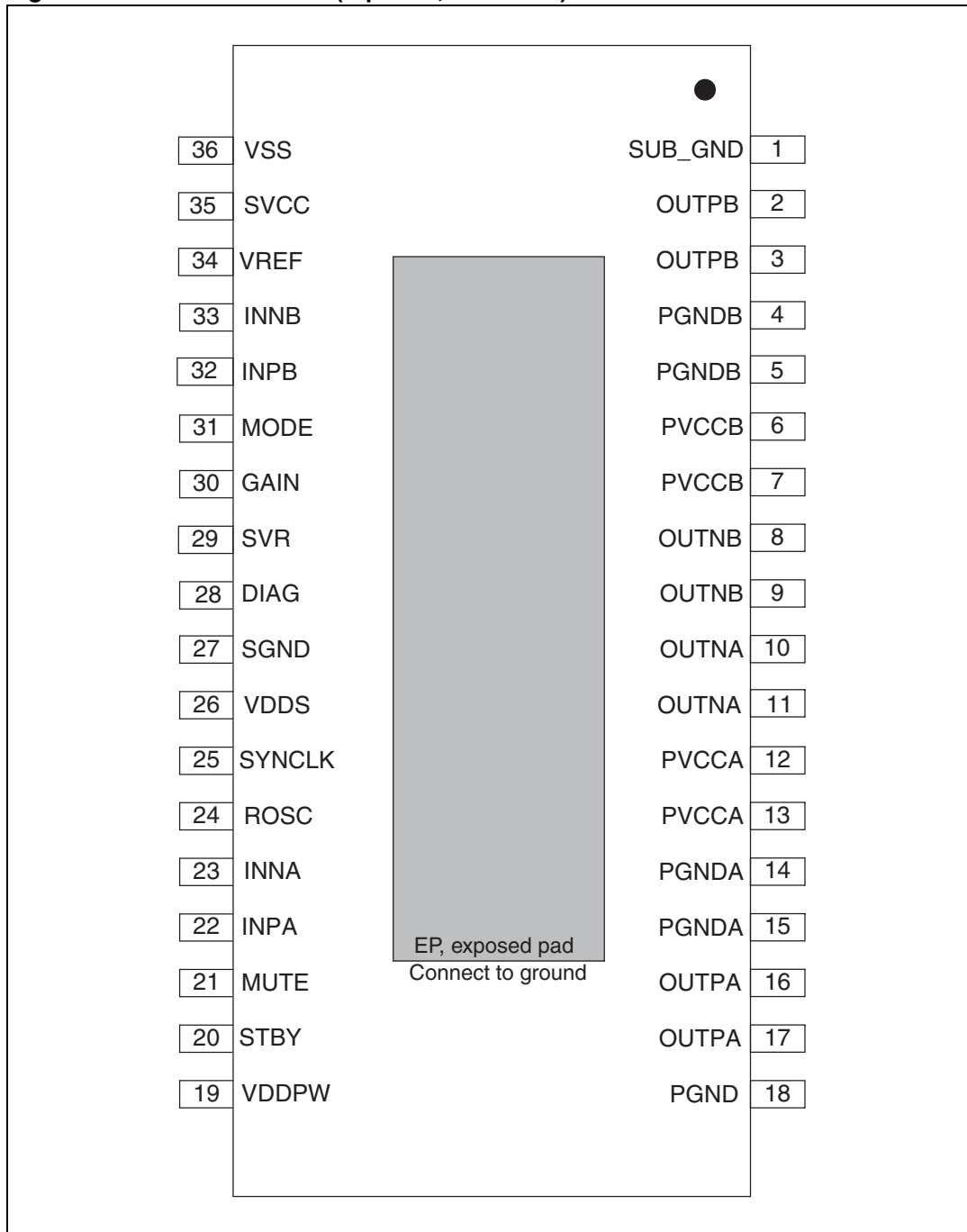
Figure 1. Internal block diagram (showing one channel only)



2 Pin description

2.1 Pinout

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



2.2 Pin list

Table 2. Pin description list

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

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, SVCC	40	V
V _I	Voltage limits for input pins STBY, MUTE, INNA, INPA, INNB, INPB, GAIN, MODE	-0.3 to 4.0	V
T _j	Operating junction temperature	0 to 150	°C
T _{op}	Operating ambient temperature	0 to 70	°C
T _{stg}	Storage temperature	-40 to 150	°C

3.2 Thermal data

Table 4. Thermal data

Symbol	Parameter	Min	Typ	Max	Unit
R _{th j-case}	Thermal resistance, junction to case	-	3.0		°C/W

3.3 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply voltage for pins PVCCA, PVCCB, SVCC	14	-	36	V
T _{amb}	Ambient operating temperature	0	-	70	°C

3.4 Electrical specifications

Unless otherwise stated, the values in the table below are specified for the conditions:
 $V_{CC} = 36\text{ V}$, $R_L = 4\ \Omega$, $R_{OSC} = R3 = 39\text{ k}\Omega$, $C8 = 100\text{ nF}$, $f = 1\text{ kHz}$, $G_V = 23.6\text{ dB}$
 $T_{amb} = 25\text{ }^\circ\text{C}$.

Table 6. Electrical specifications

Symbol	Parameter	Condition	Min	Typ	Max	Unit
I_q	Total quiescent current	No LC filter, no load	-	60		mA
I_{qSTBY}	Quiescent current in standby	-	-	1		μA
V_{OS}	Output offset voltage	$V_i = 0$ $A_v = 23.6\text{ dB}$, no load	-20	-	20	mV
I_{OCP}	Overcurrent protection threshold	$R_L = 0\ \Omega$	10	11	14	A
T_j	Junction temperature at thermal shutdown	-	140	150	160	$^\circ\text{C}$
R_i	Input resistance	Differential input		69	-	$\text{k}\Omega$
V_{UVP}	Undervoltage protection threshold	-	-	-	8	V
R_{dsON}	Power transistor on resistance	High side	-	0.15	-	Ω
		Low side	-	0.15	-	
P_o	Output power	THD = 10%	-	160	-	W
		THD = 1%	-	125	-	
P_o	Parallel BTL (mono) output power, $R_L = 3\ \text{ohm}$, $V_{cc} = 36\text{ V}$	THD = 10%	-	220	-	W
		THD = 1%	-	170	-	
η	Efficiency		-	85	-	%
THD	Total harmonic distortion	$P_o = 1\text{ W}$	-	0.05	-	%
G_V	Closed-loop gain	$GAIN_0 < 0.25 \cdot V_{DD}$		23.8		dB
		$0.25 \cdot V_{DD} < GAIN < 0.5 \cdot V_{DD}$		29.8		
		$0.5 \cdot V_{DD} < GAIN < 0.75 \cdot V_{DD}$		33.3		
		$GAIN > 0.75 \cdot V_{DD}$		35.8		
ΔG_V	Gain matching	-	-1	-	1	dB
C_T	Crosstalk	$f = 1\text{ kHz}$, $P_o = 1\text{ W}$	50	60	-	dB
V_n	Total output noise	Inputs shorted and to Ground A curve		231		μV
		Inputs shorted and to Ground $f = 20\text{ Hz to } 20\text{ kHz}$		400		μV
SVRR	Supply voltage rejection ratio	$f_r = 100\text{ Hz}$, $V_r = 0.5\text{ V}_{pp}$, $C_{SVR} = 10\ \mu\text{F}$	-	55	-	dB
T_r , T_f	Rise and fall times	-	-	35	-	ns
f_{SW}	Switching frequency	Internal oscillator	240	310	400	kHz
f_{SWR}	Output switching frequency range	With internal oscillator by changing $R_{osc}^{(1)}$	240	-		kHz

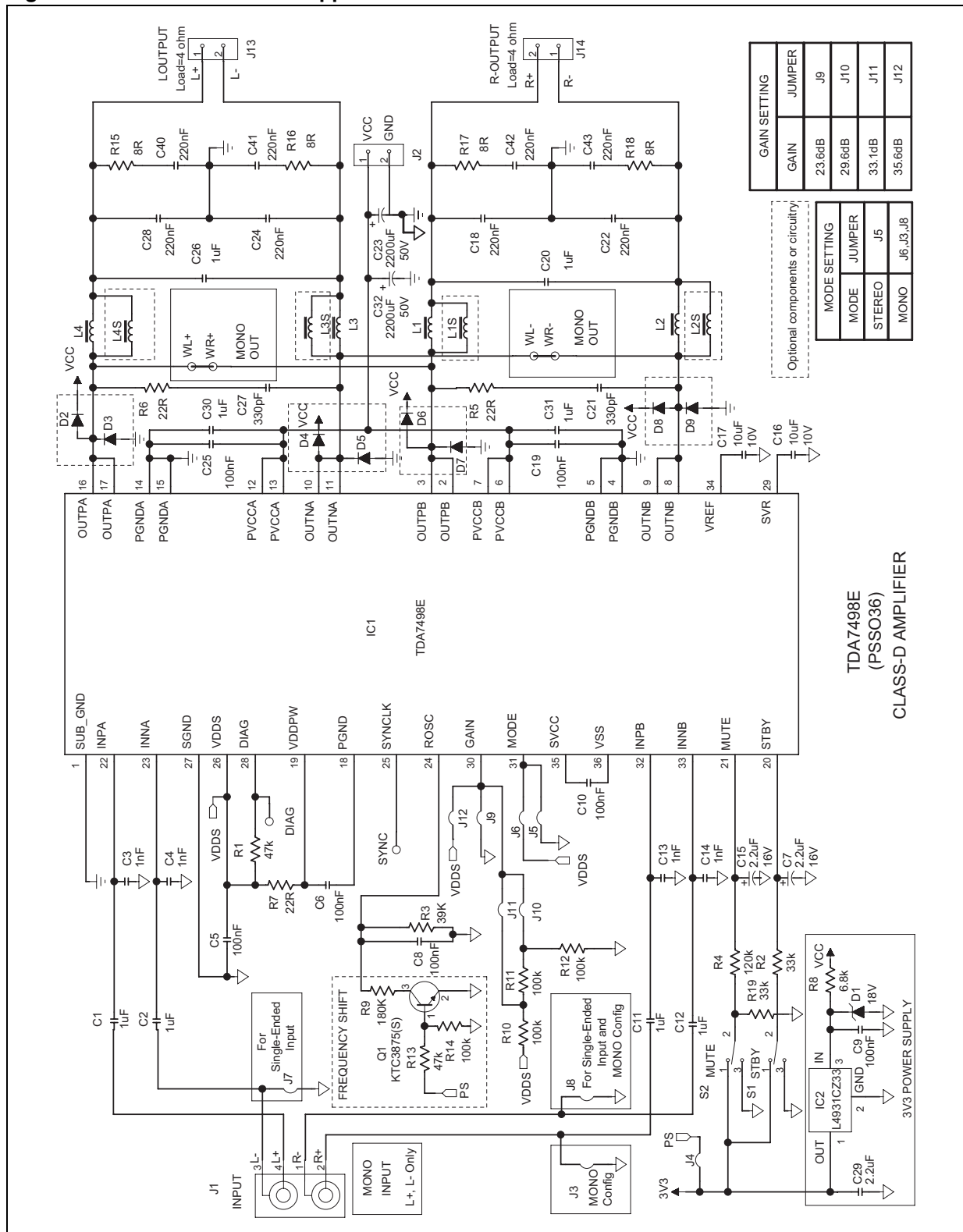
Table 6. Electrical specifications (continued)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{inH}	Digital input high (H)	-	2.0	-	-	V
V_{inL}	Digital input low (L)		-	-	0.8	
Function mode	Standby & mute & play	STBY < 0.5 V, MUTE = X	StandBy			
		STBY > 2.5 V ; MUTE < L	Mute			
		STBY > 2.5 V, MUTE > H	Play			
A_{MUTE}	Mute attenuation	$V_{MUTE} < L, V_{STBY} = H$	-	75	-	dB

1. $f_{SW} = 10^6 / ((16 * R_{OSC} + 182) * 4)$ kHz, $f_{SYNCLK} = 2 * f_{SW}$ with $R3 = 39$ k Ω (see [Figure 3](#))

3.5 Test circuit

Figure 3. Test circuit stereo application and mono BTL mode



4 Characterization curves

Unless otherwise stated, measurements were made under the following conditions:
 $V_{cc} = 36\text{ V}$, $f = 1\text{ kHz}$, $G_V = 23.6\text{ dB}$, $R_{osc} = 39\text{ k}\Omega$, $C_{osc} = 100\text{ nF}$, $T_{amb} = 25\text{ }^\circ\text{C}$.

4.1 For $R_L = 4\ \Omega$, stereo configuration

Figure 4. Output power vs. supply voltage

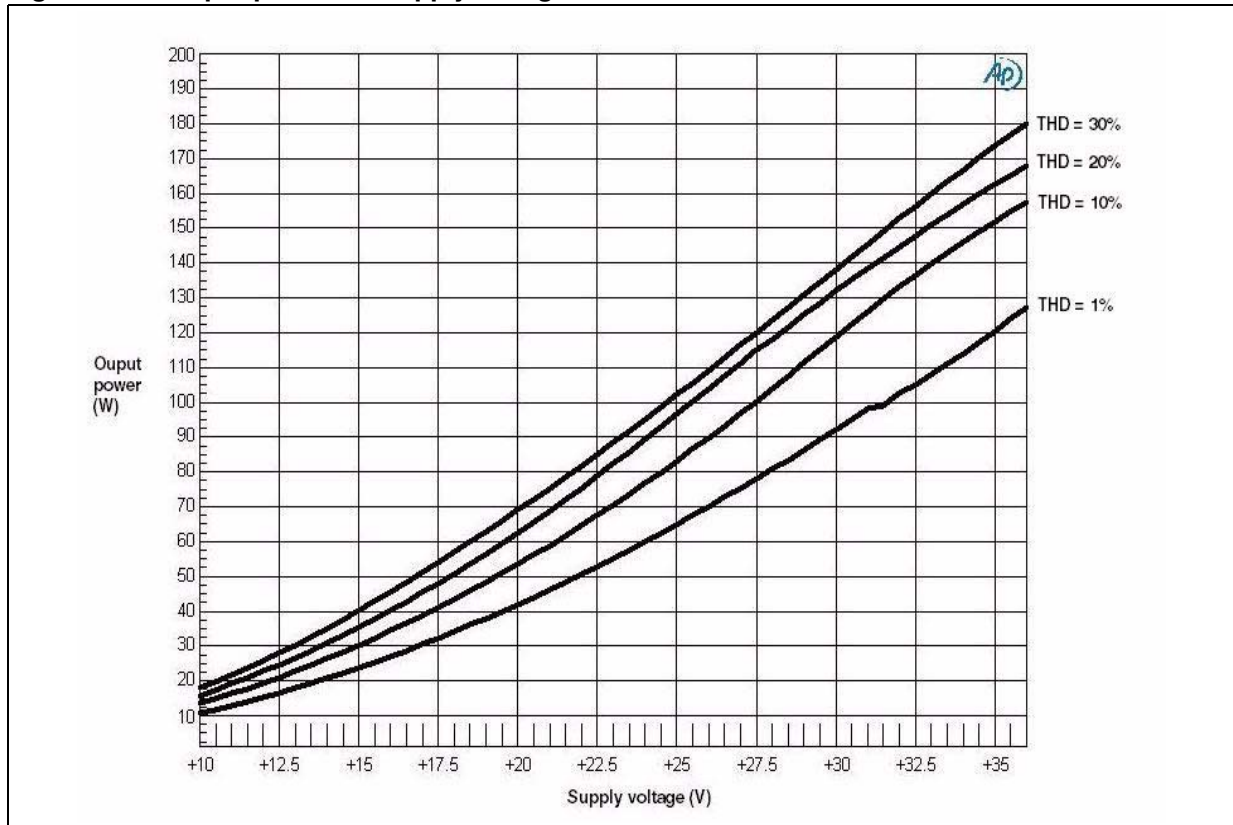


Figure 5. THD vs. output power

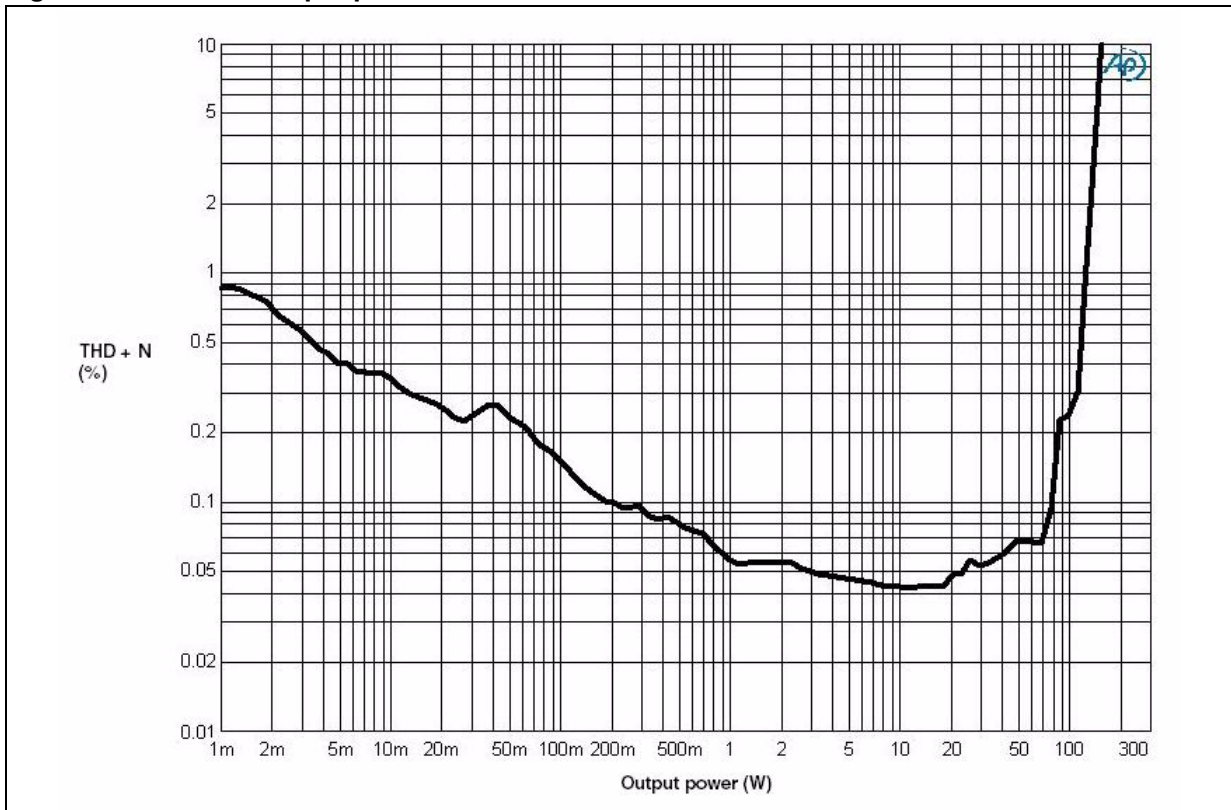


Figure 6. THD vs. frequency

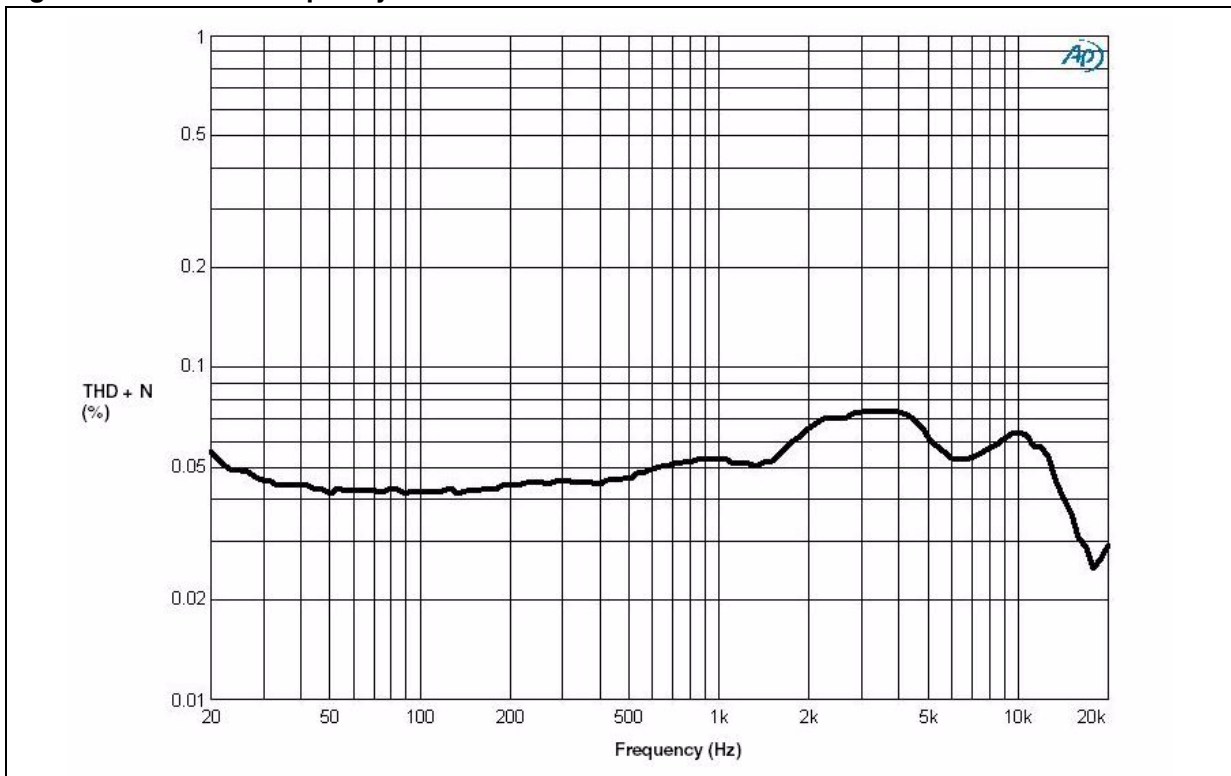


Figure 7. FFT performance

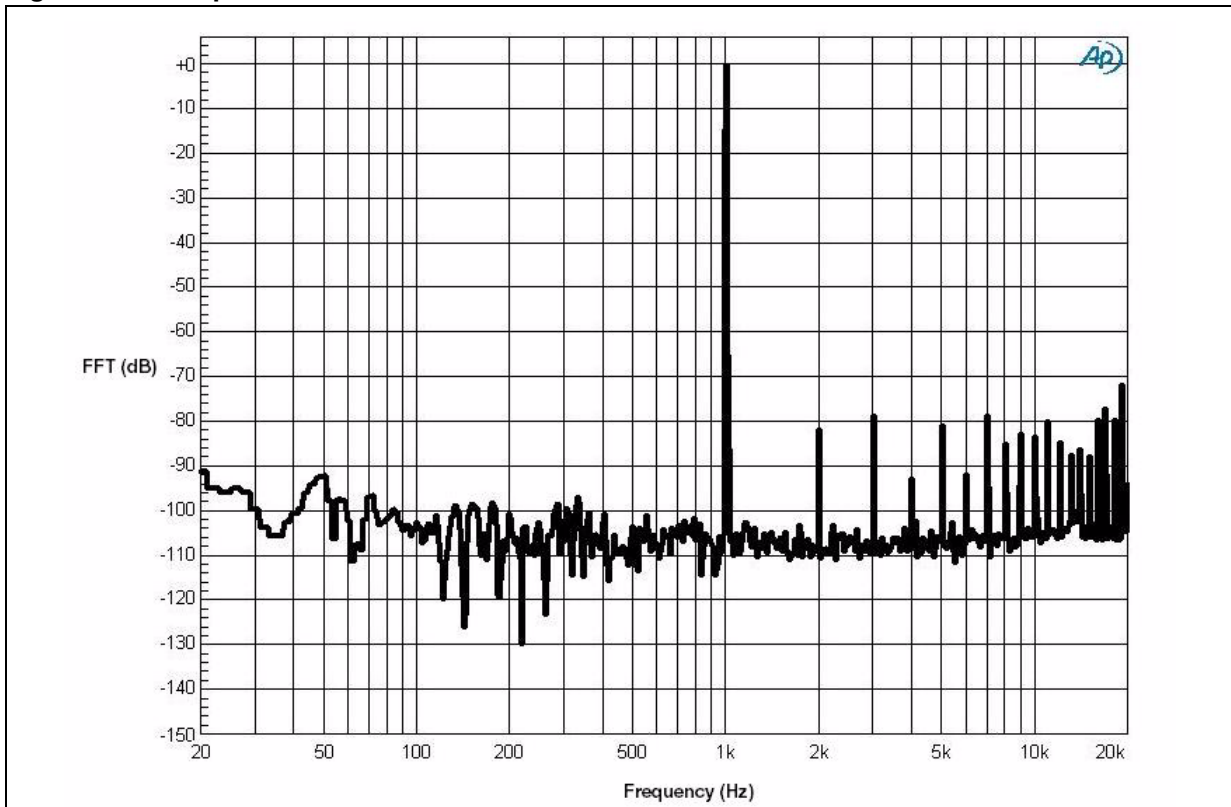
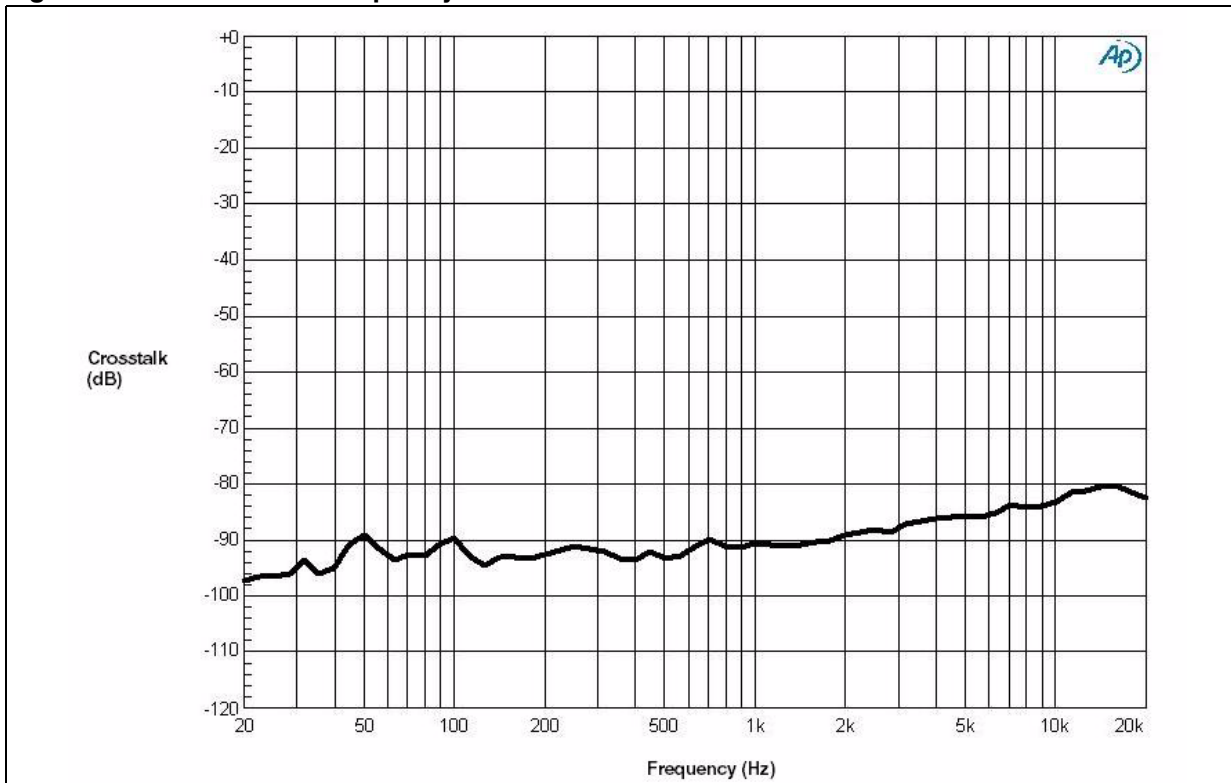


Figure 8. Crosstalk vs. frequency



4.2 For $R_L = 3 \Omega$, mono BTL configuration

Figure 9. Output power vs. supply voltage

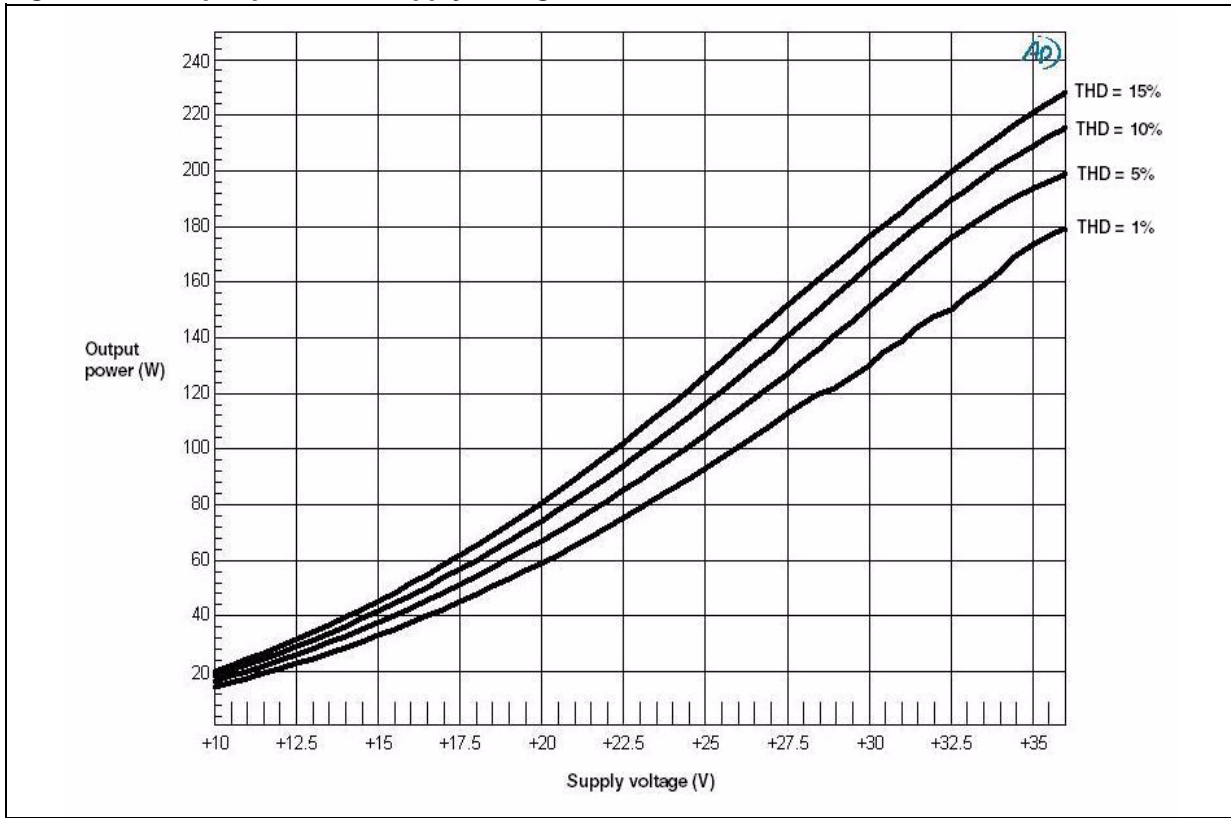


Figure 10. THD vs. output power

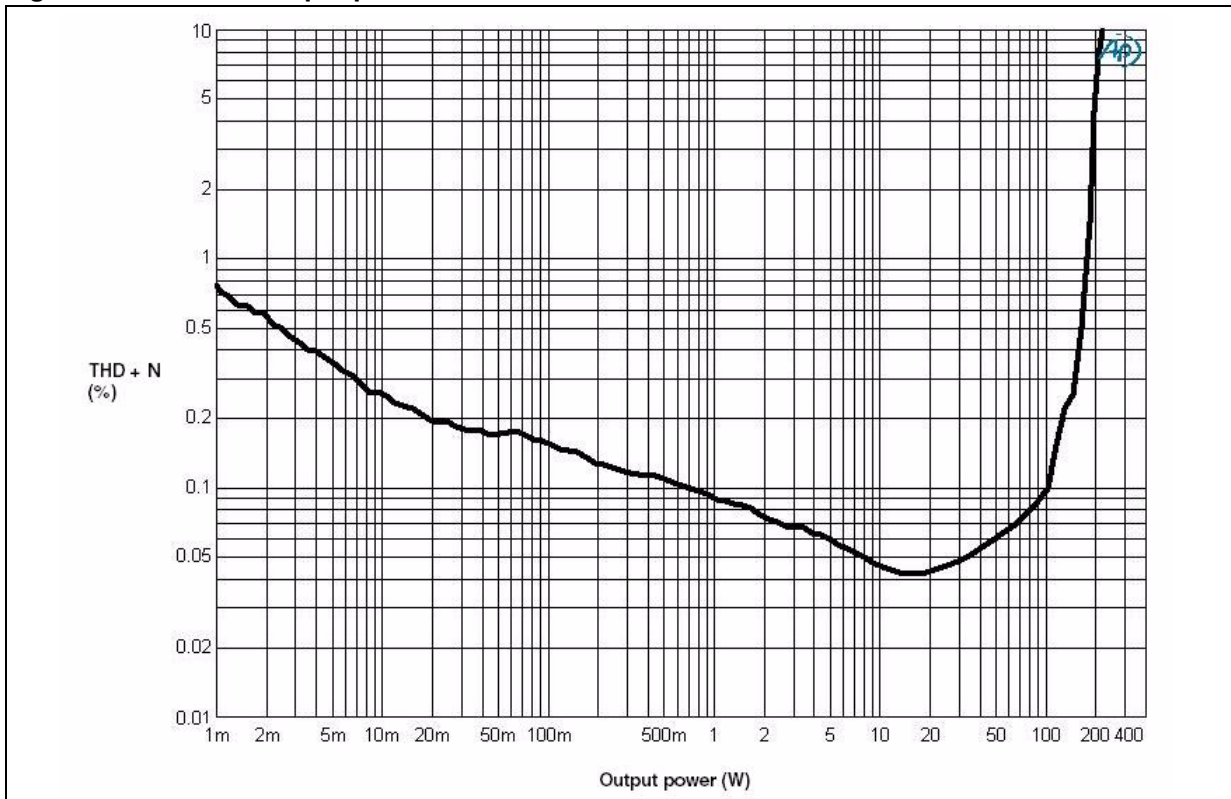
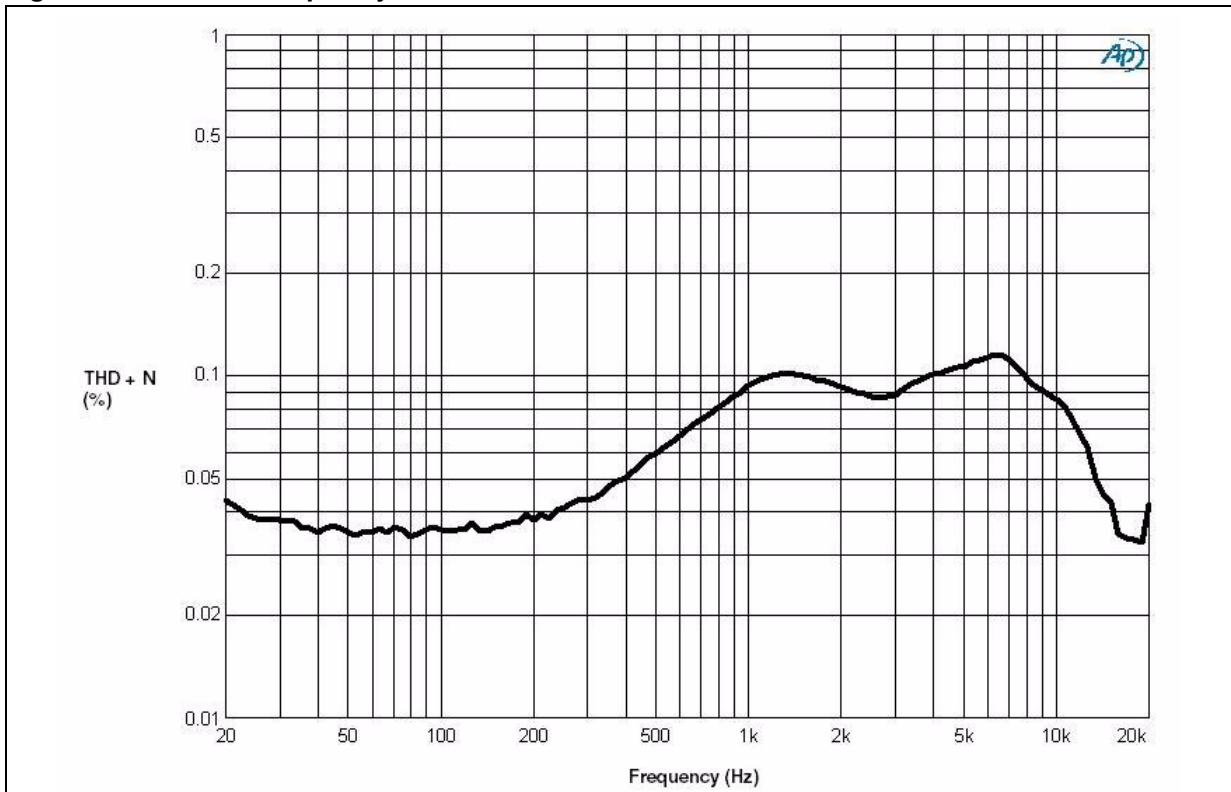


Figure 11. THD vs. frequency



5 Application information

5.1 Stereo and mono BTL operation selection using the MODE pin

The TDA7498E can be used in stereo applications or mono BTL applications. Connecting the MODE pin to the VDDS pin configures the device in mono BTL. The output of the two channels can be paralleled. When the MODE pin is connected to ground or floating (pulled down internally) the device works as a stereo amplifier.

5.2 Gain setting

The gain of the TDA7498E is set by GAIN (pin 30).

Table 7. Gain settings

GAIN0	Total Gain	Application suggestion
$VGAIN < 0.25 \cdot VDDS$	23.6 dB	GAIN pin connected to SGND
$0.25 \cdot VDDS < VGAIN < 0.5 \cdot VDDS$	29.6 dB	Rc10 = Rc11 = Rc12 = 100 K max
$0.5 \cdot VDDS < VGAIN < 0.75 \cdot VDDS$	33.1 dB	Rc10 = Rc11 = Rc12 = 100K max
$VGAIN > 0.75 \cdot VDDS$	35.6 dB	GAIN pin connected to VDDS

5.3 Smart protection

To avoid dynamic impedance drop, two overcurrent thresholds are set. The first threshold is for the overcurrent limit. The device limits the output current to the first threshold but does not shut down the PWM outputs.

If the device is shorted and at least one of the two output currents reaches the second threshold, the device is shut down immediately. The device will recover automatically when the fault is removed from the BTL outputs.

6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

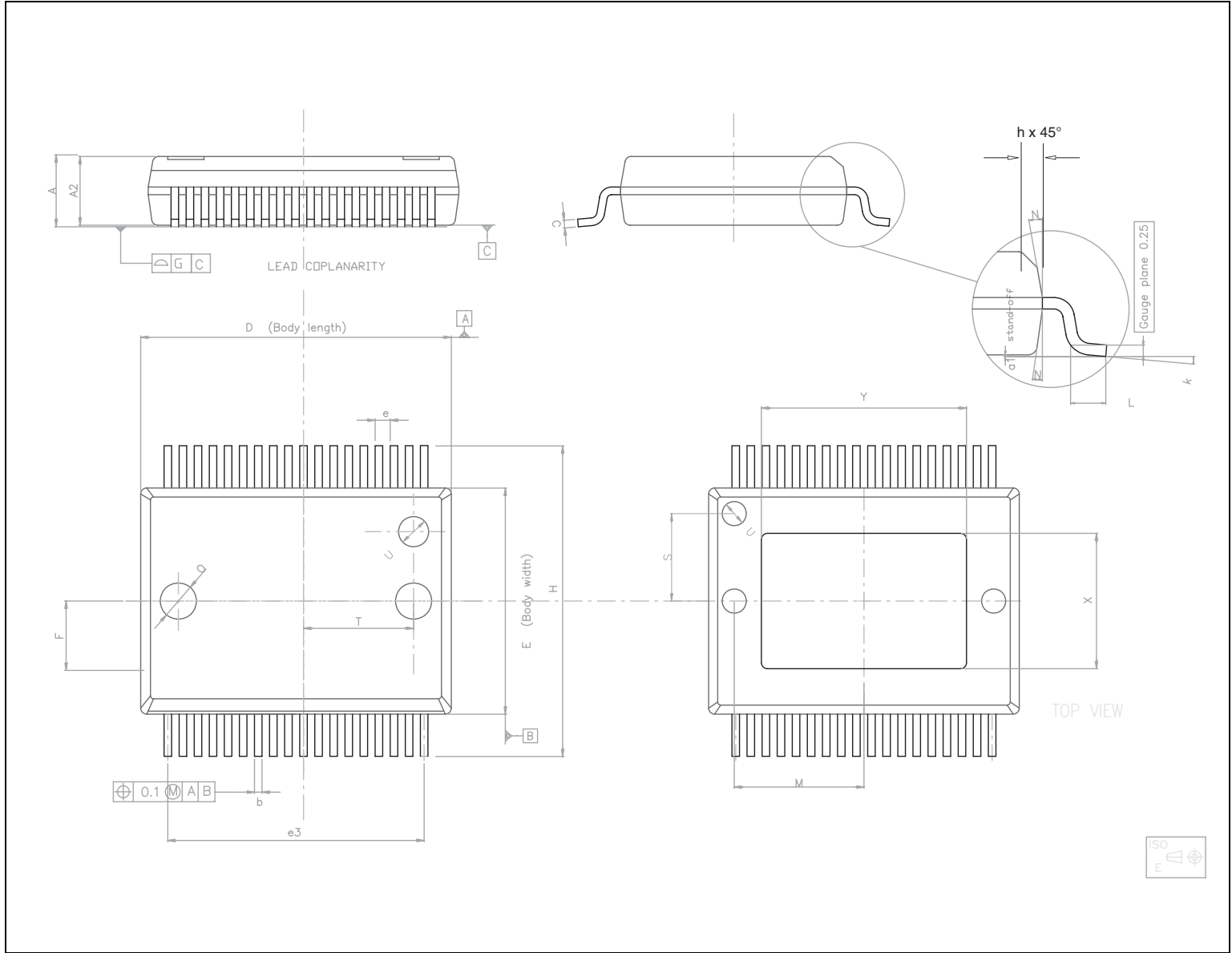
The TDA7498E comes in a 36-pin PowerSSO package with exposed pad up.

[Figure 12](#) shows the package outline and [Table 8](#) gives the dimensions.

Table 8. PowerSSO36 EPU dimensions

Symbol	Dimensions in mm			Dimensions in inches		
	Min	Typ	Max	Min	Typ	Max
A	2.15	-	2.45	0.085	-	0.096
A2	2.15	-	2.35	0.085	-	0.093
a1	0	-	0.10	0	-	0.004
b	0.18	-	0.36	0.007	-	0.014
c	0.23	-	0.32	0.009	-	0.013
D	10.10	-	10.50	0.398	-	0.413
E	7.40	-	7.60	0.291	-	0.299
e	-	0.5	-	-	0.020	-
e3	-	8.5	-	-	0.335	-
F	-	2.3	-	-	0.091	-
G	-	-	0.10	-	-	0.004
H	10.10	-	10.50	0.398	-	0.413
h	-	-	0.40	-	-	0.016
k	0	-	8 degrees	-	-	8 degrees
L	0.60	-	1.00	0.024	-	0.039
M	-	4.30	-	-	0.169	-
N	-	-	10 degrees	-	-	10 degrees
O	-	1.20	-	-	0.047	-
Q	-	0.80	-	-	0.031	-
S	-	2.90	-	-	0.114	-
T	-	3.65	-	-	0.144	-
U	-	1.00	-	-	0.039	-
X	4.10	-	4.70	0.161	-	0.185
Y	4.90	-	7.10	0.193	-	0.280

Figure 12. PowerSSO36 EPU outline drawing



7 Revision history

Table 9. Document revision history

Date	Revision	Changes
12-Dec-2011	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com