

TPA3123D2 2.1 AUDIO POWER AMPLIFIER DEMO BOARD

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INTRODUCTION:

The TPA3123D2 2.1 Demo evaluation module consists of two 25-W, class-D, TPA3123D2 audio power amplifiers complete with a small number of external components mounted on a circuit board that are used to directly drive speakers with external analog audio source as the input. One TPA3123D2 is configured as a stereo amplifier driving the treble speakers and another TPA3123D2 is configured as a mono amplifier driving the subwoofer speaker.

TABLE1:TPA3123D2 2.1 Demo EVM's Specifications

	Value	UNIT
VCC	10 to 30	V
ICC	4	A
Stereo PO Continuous output power: 4Ohms;Vcc =24V ;THD+N% =10	18	W
Mono PO Continuous output power: 8Ohms;Vcc =24V ;THD+N% =10	40	W
ZLMinimum load impedance (stereo)	3.2	Ohms
ZLMinimum load impedance (Mono)	6.4	Ohms

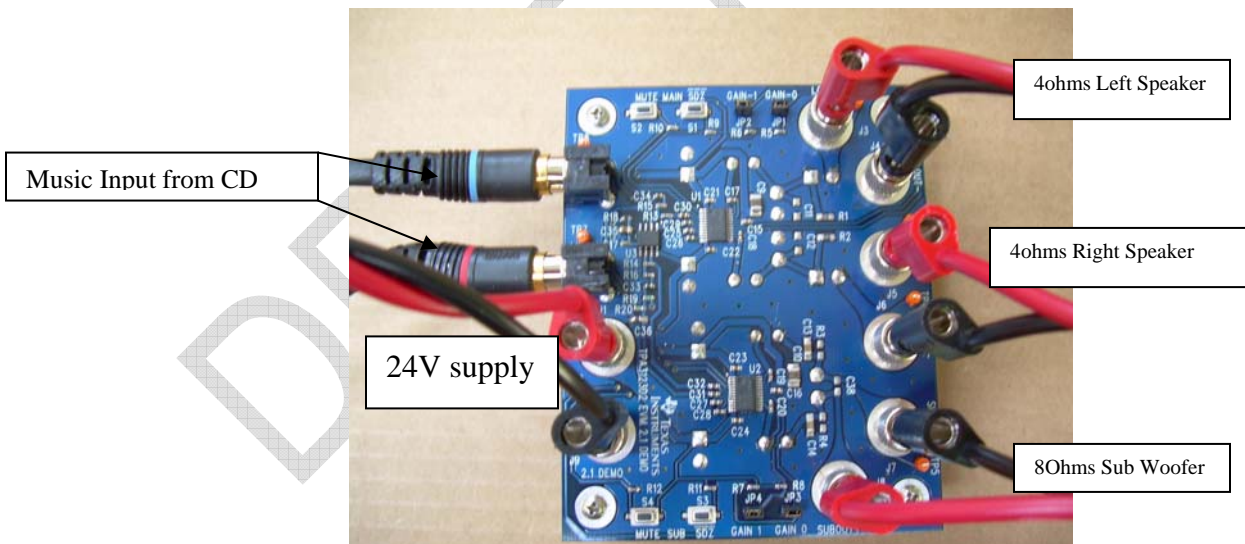


Figure 1. TPA3123D2 2.1 DEMO BOARD Audio Power Amplifier EVM (Top View)

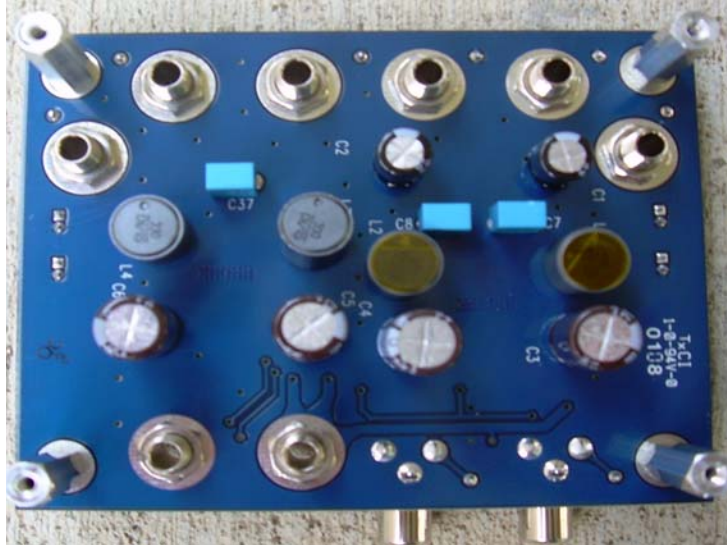


Figure 2. TPA3123D2 2.1 DEMO BOARD Audio Power Amplifier EVM (Bottom View)

2. OPERATION

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA3123D2 2.1 Demo EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM module can be made by inserting stripped wire, or using banana plugs for the power supply and output connections. The inputs accept standard RCA plugs.

2.1.1 Power Supply

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted from 10 V to 30 V to the module VCC (**J10**) and GND (**J9**) banana jacks taking care to observe marked polarity.

2.1.2 Evaluation Module Preparations

INPUTS AND OUTPUTS:

1. Connect an audio source to the input jacks, **J1** and **J2**.
2. Connect a speaker across -ROUT (**J6**) and +ROUT (**J5**). Connect another speaker across LOUT (**J3**) and -LOUT (**J4**) (**Note: Make sure the speakers are of 4 Ohms Each**)
3. Connect a Subwoofer across -SUBWOOF OUT (**J7**) and +SUBWOOF OUT (**J8**). (**Note: Make sure the subwoofer is of 8 Ohms**)
4. Install both gain jumpers GAIN0 (**J1**) and GAIN1 (**J2**). This sets the gain of the amplifier to the lowest Level, 20 dB.

**Note: ON means Jumpers ON
OFF means Jumpers OFF**

TABLE 2: GAIN SETTINGS

Gain1	Gain0	Amplifier Gain (dB)
ON	ON	20
ON	OFF	26
OFF	ON	32
OFF	OFF	36

CONTROL INPUTS:

SHUTDOWN: This terminal is active LOW. A LOW (<0.8 V) shuts down the amplifier; a HIGH (>2 V) on the device terminal places the amplifier in the active state. Holding down Switch S1 places the amplifier in the SHUTDOWN state. Releasing S1 returns the amplifier to the active state. This terminal is VCC compliant. There is also a switch S3 for the Subwoofer output which puts the Subwoofer in the shutdown mode when it is hold down.

MUTE: This terminal is active HIGH. A HIGH (>2 V) on this terminal will immediately terminate audio Playback through the speakers; a LOW (<0.8 V) enables the device. The outputs remain switching with fifty percent duty cycle. SW2 on the EVM controls the state of the MUTE terminal. Holding down switch S2 places the amplifier (1) in the MUTE state. Releasing S2 returns the amplifier (1) to the active state meant for the stereo speaker output. This terminal is VCC compliant. Holding down switch S4 places the amplifier (2) in the MUTE state. Releasing S4 returns the amplifier (2) to the active state which is meant for the Subwoofer output.

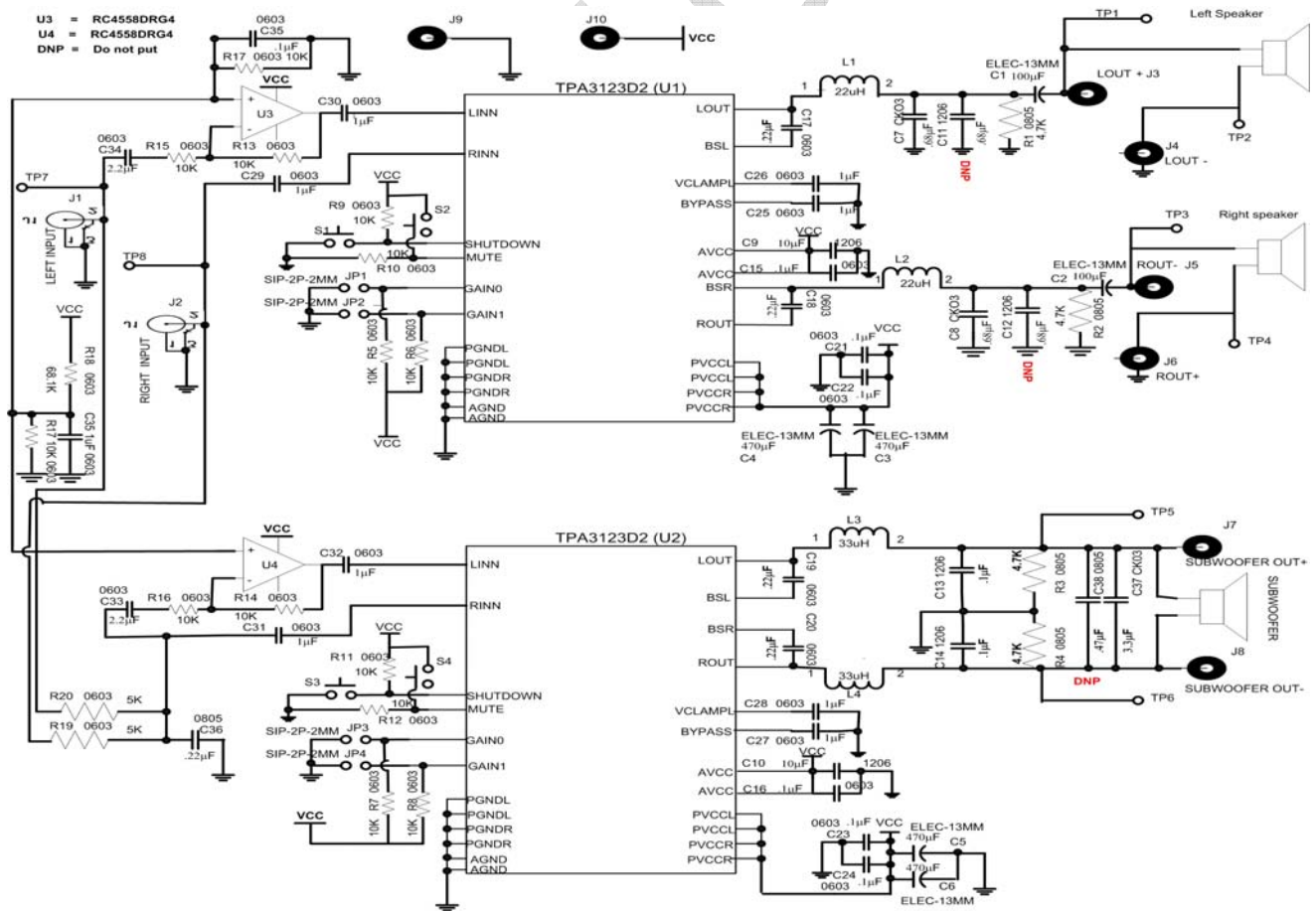
GAIN0/GAIN1: Together, these terminals determine the gain of the amplifiers (**one pair for the stereo speaker output and one pair for the Subwoofer output**) on the EVM. See Table 1. Installing a Jumper in JP1 or JP2 sets the respective terminal to GND. Removing the jumper sets the respective terminals to VCC. Removing jumpers increases the gain while installing jumpers decreases the gain. Logic levels are TTL compatible. These terminals are VCC compliant.

2.1.3 POWER UP

Verify correct voltage and input polarity, and turn the external power supplies ON. The EVM should begin operation.

1. Adjust the input signal.(If giving input from the AP then adjust the input V rms in the analog generator window still it gives a THD of 10%) to get reasonable output)
2. Adjust the control inputs to the desired settings.
3. Adjust the amplifier gain by installing/removing the gain jumpers, JP1 and JP2 for the stereo output and jumpers JP4 and JP3.

SCHEMATIC:



TPA3123D2 2.1EVM Performance STEREO PERFORMANCE

Figure 6: Frequency Response

Frequency Response Stereo Output TPA3123D2 2.1

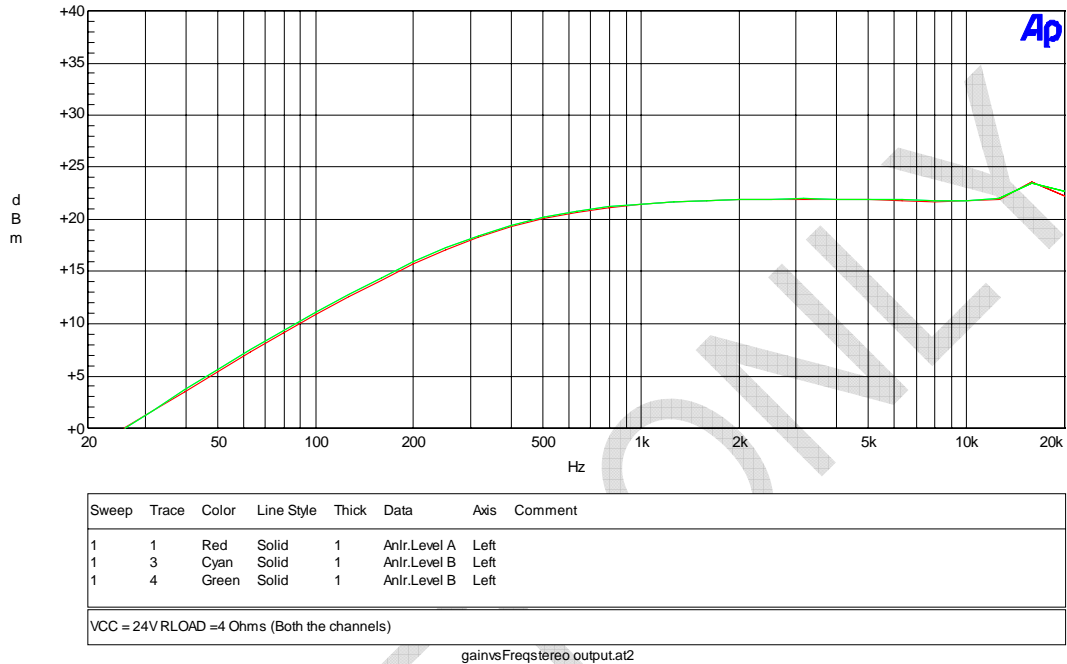


Figure 7: THD vs. Frequency

THDvs. Freq. Stereo Output TPA3123D2

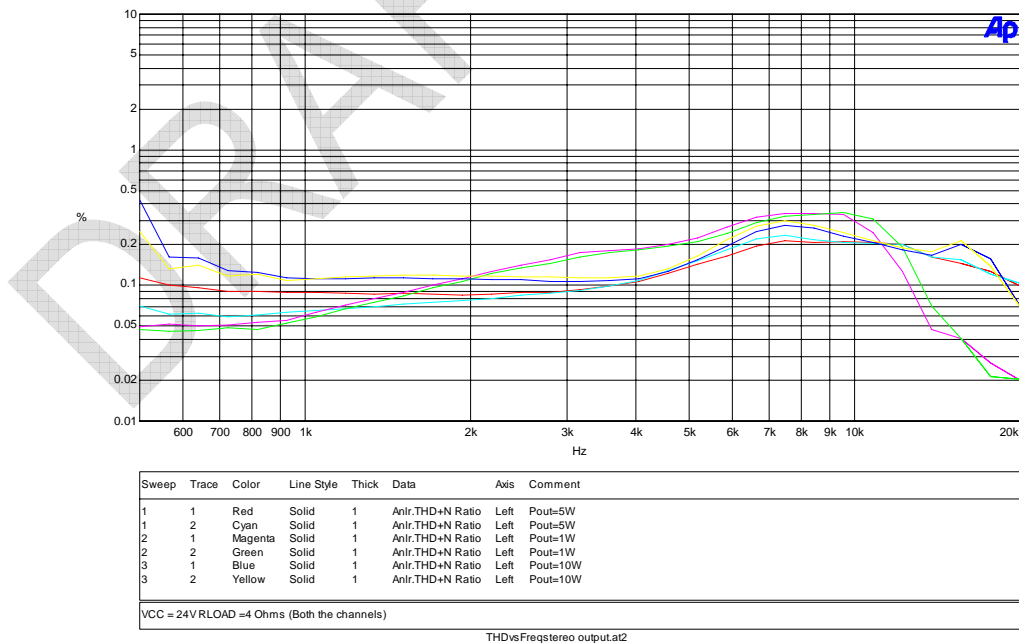
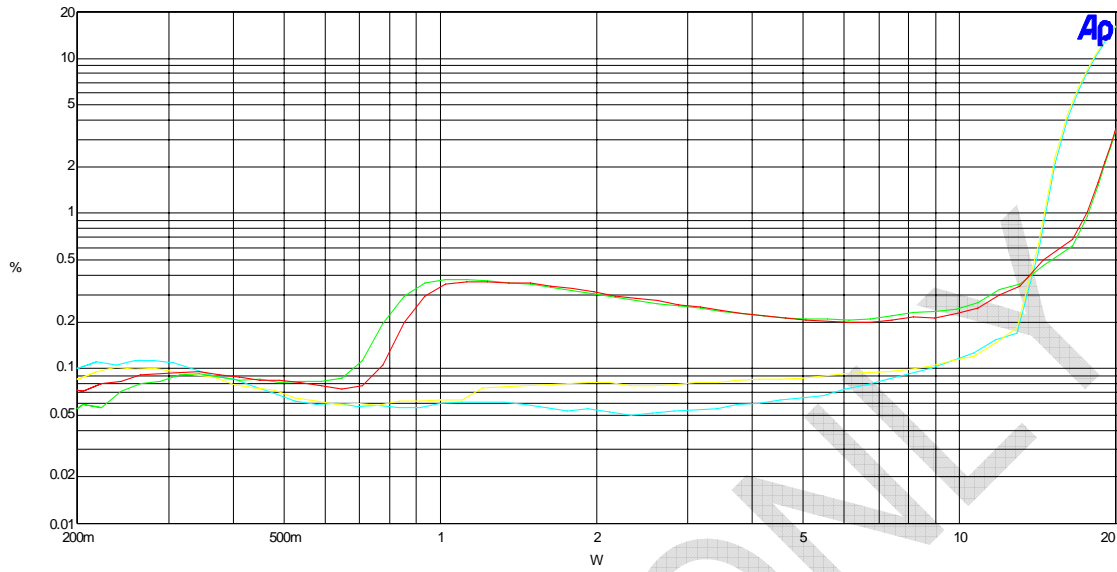


Figure 8: THD vs. Power

THD vs Po Stereo Output TPA3123D2 2.1



Sweep	Trace	Color	Line Style	Thick	Data	Avis	Comment
1	1	Cyan	Solid	1	Anlr.THd+N Ratio	Left	Freq. =1KHz
1	3	Yellow	Solid	1	Anlr.THd+N Ratio	Left	Freq. =1KHz
2	1	Green	Solid	1	Anlr.THd+N Ratio	Left	Freq. =10KHz
2	3	Red	Solid	1	Anlr.THd+N Ratio	Left	Freq. =10KHz

VCC = 24V RLOAD = 4 Ohms (Both the channels)

THD_POWER.Stereoutput.a2

SUBWOOFER PERFORMANCE

Figure 9: Frequency Response

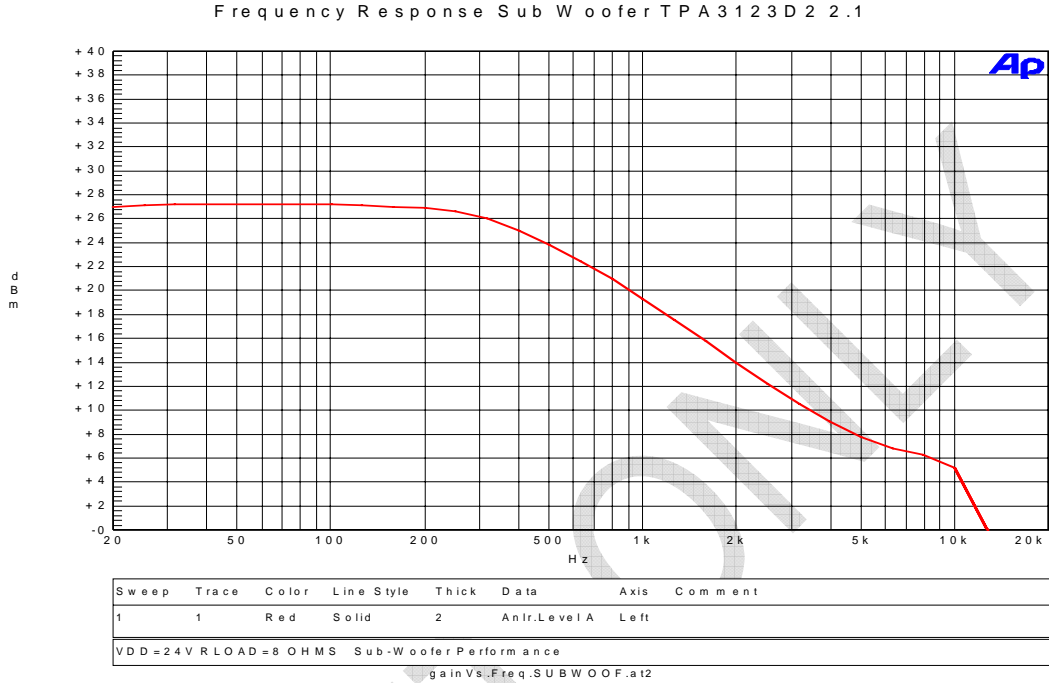


Figure 10: THD vs. Frequency

THD vs. Freq. subwoofer TPA3123D2 2.1

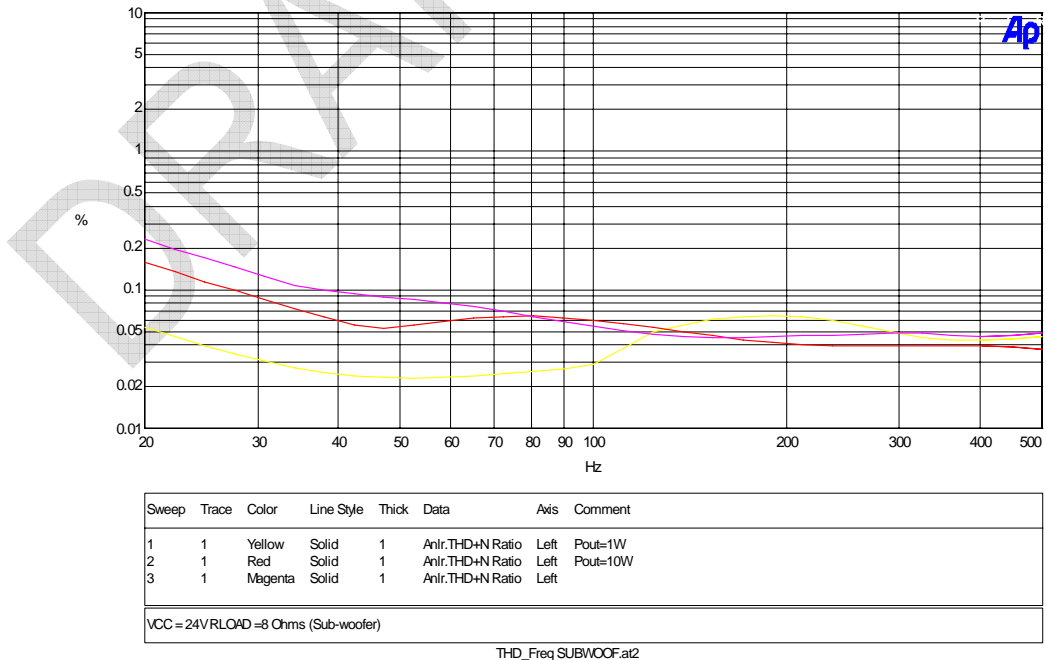
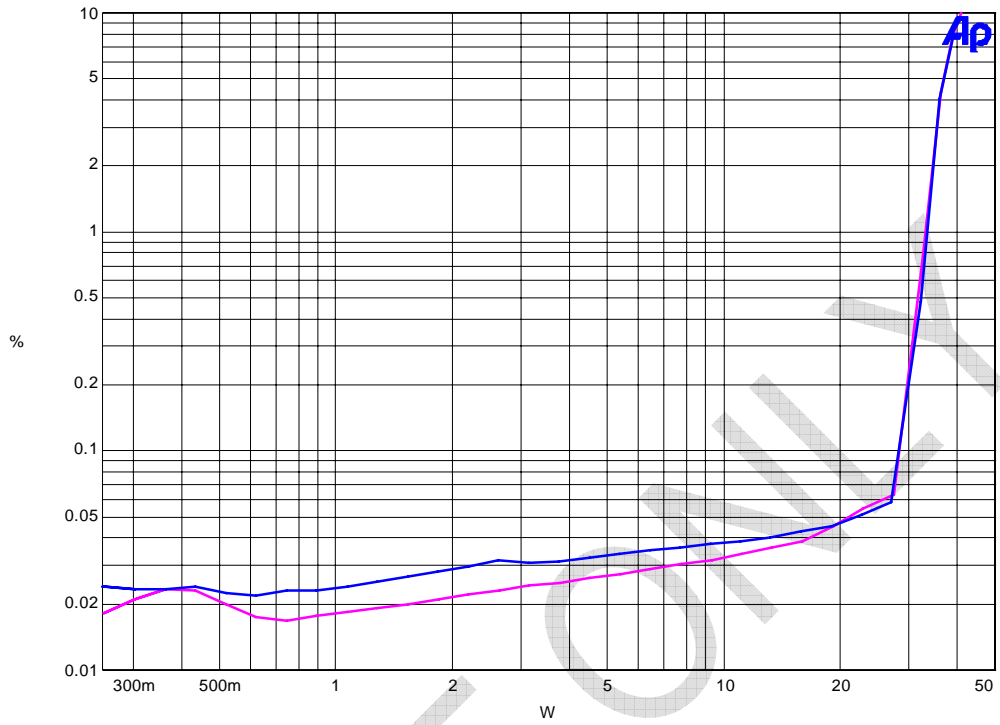


Figure 11: THD vs. Power



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Magenta	Solid	2	Anlr.THd+N Ratio	Left	Freq. - 100Hz
2	1	Blue	Solid	2	Anlr.THd+N Ratio	Left	Freq. - 200Hz

VDD=24V RLOAD=8 OHMS Sub-Woofer Performance

THD_POWER SUBWOOF.at2

TABLE 3:TPA3123D2 2.1 EVM BOM (Bill of materials)

Item	QTY	Ref	Val	Volt	Tol	Decal	MFG #1
1	1	C1	100uF	50V	20%	ELE-13MM	Nichicon/DigiKey
2	1	C2	100uF	50V	20%	ELE-13MM	Nichicon/DigiKey
3	1	C3	470uF	35V	20%	ELE-13MM	Nichicon/DigiKey
4	1	C4	470uF	35V	20%	ELE-13MM	Nichicon/DigiKey
5	1	C5	470uF	35V	20%	ELE-13MM	Nichicon/DigiKey
6	1	C6	470uF	35V	20%	ELE-13MM	Nichicon/DigiKey
7	1	C7	0.68uF	50V	5%	CK03	EPCOS/DigiKey
8	1	C8	0.68uF	50V	5%	CK03	EPCOS/DigiKey
9	1	C9	10uF	50V	80-20%	1210	Murata/DigiKey
10	1	C10	10uF	50V	80-20%	1210	Murata/DigiKey
11	1	C11	0.68uF	50V	10%	1206	TDK/Digikey
12	1	C12	0.68uF	50V	10%	1206	TDK/Digikey
13	1	C13	0.68uF	50V	10%	1206	TDK/Digikey
14	1	C14	0.68uF	50V	10%	1206	TDK/Digikey
15	1	C15	0.1uF	50V	10%	603	TDK/DigiKey
16	1	C16	0.1uF	50V	10%	603	TDK/DigiKey
17	1	C17	0.22uF	16V	10%	603	TDK/DigiKey
18	1	C18	0.22uF	16V	10%	603	TDK/DigiKey
19	1	C19	0.22uF	16V	10%	603	TDK/DigiKey
20	1	C20	0.22uF	16V	10%	603	TDK/DigiKey
21	1	C21	0.1uF	50V	10%	603	TDK/DigiKey
22	1	C22	0.1uF	50V	10%	603	TDK/DigiKey
23	1	C23	0.1uF	50V	10%	603	TDK/DigiKey
24	1	C24	0.1uF	50V	10%	603	TDK/DigiKey
25	1	C25	1uF	16V	10%	603	Taiyo Yuden/DigiKey
26	1	C26	1uF	16V	10%	603	Taiyo Yuden/DigiKey
27	1	C27	1uF	16V	10%	603	Taiyo Yuden/DigiKey
28	1	C28	1uF	16V	10%	603	Taiyo Yuden/DigiKey
29	1	C29	1uF	16V	10%	603	Taiyo Yuden/DigiKey
30	1	C30	1uF	16V	10%	603	Taiyo Yuden/DigiKey
31	1	C31	1uF	16V	10%	603	Taiyo Yuden/DigiKey
32	1	C32	1uF	16V	10%	603	Taiyo Yuden/DigiKey
33	1	C33	2.2uF	16V	10%	603	Taiyo Yuden/DigiKey
34	1	C34	2.2uF	16V	10%	603	Taiyo Yuden/DigiKey
35	1	C35	1uF	50V	10%	603	AVX/DigiKey
36	1	C36	.22uF	10V	10%	805	Murata/DigiKey
37	1	C37	3.3uF	50V	10%	805	Murata/DigiKey
38	1	C38	0.68uF	50V	5%	CK03	EPCOS/DigiKey
39	1	J1				PHONOGOLDSW	Switchcraft/Newark
40	1	J2				PHONOGOLDSW	Switchcraft/Newark
41	1	J3				BANANA-JACK	Johnson/DigiKey
42	1	J4				BANANA-JACK	Johnson/DigiKey
43	1	J5				BANANA-JACK	Johnson/DigiKey
44	1	J6				BANANA-JACK	Johnson/DigiKey
45	1	J7				BANANA-JACK	Johnson/DigiKey
46	1	J8				BANANA-JACK	Johnson/DigiKey
47	1	J9				BANANA-JACK	Johnson/DigiKey
48	1	J10				BANANA-JACK	Johnson/DigiKey
49	1	JP1				SIP-2P-MM	Norcomp/DigiKey
50	1	JP2				SIP-2P-MM	Norcomp/DigiKey
51	1	JP3				SIP-2P-MM	Norcomp/DigiKey

Contd...

52	1 JP4		SIP-2P-MM	Norcomp/DigiKey
53	1 L1	22uH	IND-UPRIGHT-200	Toko
54	1 L2	22uH	IND-UPRIGHT-200	Toko
55	1 L3	33uH	IND-UPRIGHT-200	Toko
56	1 L4	33uH	IND-UPRIGHT-200	Toko
57	1 R1	4.70K	0.10% 805	Panasonic/DigiKey
58	1 R2	4.70K	0.10% 805	Panasonic/DigiKey
59	1 R3	4.70K	0.10% 805	Panasonic/DigiKey
60	1 R4	4.70K	0.10% 805	Panasonic/DigiKey
61	1 R5	10K	1% 603	Panasonic/DigiKey
62	1 R6	10K	1% 603	Panasonic/DigiKey
63	1 R7	10K	1% 603	Panasonic/DigiKey
64	1 R8	10K	1% 603	Panasonic/DigiKey
65	1 R9	10K	1% 603	Panasonic/DigiKey
66	1 R10	10K	1% 603	Panasonic/DigiKey
67	1 R11	10K	1% 603	Panasonic/DigiKey
68	1 R12	10K	1% 603	Panasonic/DigiKey
69	1 R13	10K	1% 603	Panasonic/DigiKey
70	1 R14	10K	1% 603	Panasonic/DigiKey
71	1 R15	10K	1% 603	Panasonic/DigiKey
72	1 R16	10K	1% 603	Panasonic/DigiKey
73	1 R17	10K	1% 603	Panasonic/DigiKey
74	1 R18	68.1K	1% 603	Panasonic/DigiKey
75	1 R19	5K	1% 603	Panasonic/DigiKey
76	1 R20	5K	1% 603	Panasonic/DigiKey
77	1 S1		PB-SPST-NO-LO	Panasonic/DigiKey
78	1 S2		PB-SPST-NO-LO	Panasonic/DigiKey
79	1 S3		PB-SPST-NO-LO	Panasonic/DigiKey
80	1 S4		PB-SPST-NO-LO	Panasonic/DigiKey
81	1 TP1		PAD	Keystone/DigiKey
82	1 TP2		PAD	Keystone/DigiKey
83	1 TP3		PAD	Keystone/DigiKey
84	1 TP4		PAD	Keystone/DigiKey
85	1 TP5		PAD	Keystone/DigiKey
86	1 TP6		PAD	Keystone/DigiKey
87	1 TP7		PAD	Keystone/DigiKey
88	1 TP8		PAD	Keystone/DigiKey
89	1 U1		HSSOP24PWP	
90	1 U2		HSSOP24PWP	
91	1 U3		SOIC8	TI
92	1 X1		MTHOLE	
93	1 X2		MTHOLE	
94	1 X3		MTHOLE	
95	1 X4		MTHOLE	
96	1 X5		THERMAL3X10	
97	1 X6		THERMAL3X10	

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