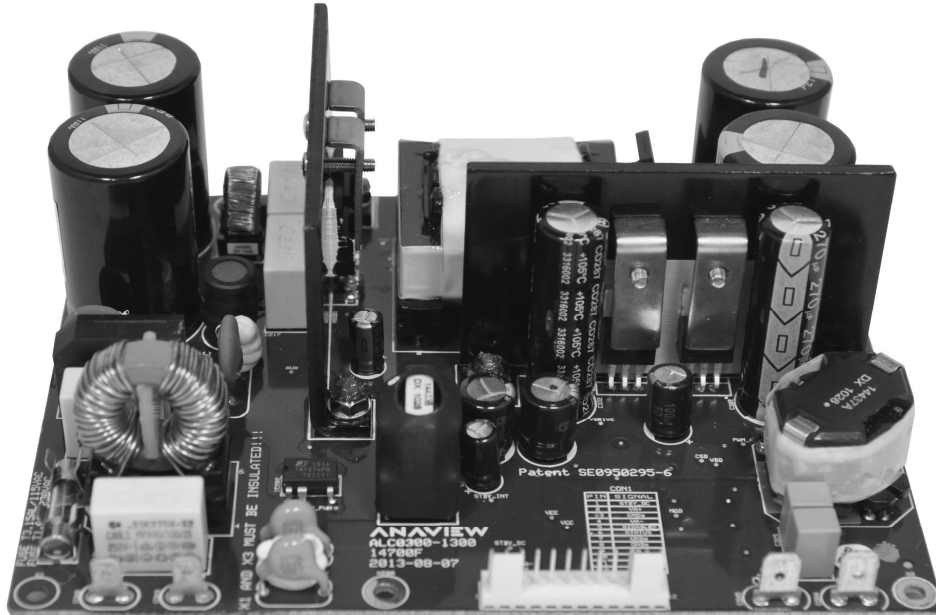


PRODUCT DATA SHEET AUDIO LINE COMBINATION ALC0300-1300



SCOPE

These technical specifications describes the functionalities and features of the Anaview Audio Line Combination ALC0300-1300, an integrated audio solution combining high-end amplifier and power supply technology, capable of delivering 350W into 4Ω @1%THD or 200W into 8Ω @1%THD. Instantaneous peak power 420W into 4Ω. Typical applications are audio receivers, powered speakers and residential audio systems.

Disclaimer

The data sheet contains specifications that may be subject to change without prior notice. Responsibility for verifying the performance, safety, reliability and compliance with legal standards of end products using this subassembly falls to the manufacturer of said end product.

ANAVIEW products are not authorized for use as critical components in life support devices or life support systems without the express written approval of the president of ETAL Group AB. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labelling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	1 of 16

GENERAL

Environmental conditions

Humidity	5 – 85% RH non condensing
Operating Temperature Ambient	0°C to +55°C
Normal operation ambient temperature	0°C to +45°C
Storage Temperature	-40°C to +85°C

Regulations and compliances

EMC	Emission	Conducted Emission FCC 15V, Sec. 107 Class #B+ Radiated Emission FCC 15V, Sec. 109 Class #B+ Conducted Emission EN 55022 (2010) Class #B+ Telecom Conducted Emission EN 55022 (2010) Class #B+ Radiated Emission EN 55022 (2010) Class #B+ Power Line Harmonics EN 61000-3-2 (2006) + A1 (2009) + A2 (2009) Power Line Flicker EN 61000-3-3 (2008)	0.15 MHz . 30 MHz 30 MHz . 1 GHz 0.15 MHz . 30 MHz 0.15 MHz . 30 MHz 30 MHz . 1 GHz
	Immunity	ESD Immunity IEC 61000-4-2 (2008) Radio Frequency Immunity IEC 61000-4-3 (2006) + A1 (2007) + A2 (2010) Electrical Fast Transient Immunity IEC 61000-4-4 (2004) + A1 (2010) Surge Immunity IEC 61000-4-5 (2005) RF Common Mode Immunity IEC 61000-4-6 (2008) Power Frequency Magnetic Field IEC 61000-4-8 (2009) Voltage Dips and Short Interruptions IEC 61000-4-11 (2004)	Criterion B Criterion A Criterion B Criterion B Criterion A Criterion A Criterion B and C
Safety	LVD	IEC 60065:2001 + A1:2005 + A2:2010 EN 60065:2002 + A1:2006 + A11:2008 + A2:2010 + A12:2011 UL 60065 7 th Ed. Revised 2012-09-21 CAN/CSA C22.2 No. 60065-03, 1 st Ed., 2006-04 + A1:2006 + A2:2012	
Power Loss	EuP Energy Star	Designed to enable system compliance with: 2005/32/EC . 1275/2008: Standby/Off Mode Loss, Annex II Point 1 Energy Star . Consumer Audio Products, Phase II	

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	2 of 16

Miscellaneous product specifications

Cooling	Convection cooling
Mounting of the unit	See Figure 1 Board outline, dimensions
IEC Protection Class	Class II - Double insulation
Efficiency	84% at 230Vac, 1kHz 300W into 4Ω
Idle power consumption	10W max at 230VAC, with Maximum load for Energy Star compliance
Standby mode power consumption	700mW typ. when remote shut down by DISABLE input.
Manufacturing according to workmanship standard	IPC-A-610, Revision D, February 2005

ELECTRICAL SPECIFICATIONS

Input specifications:

Mains input voltage (*1)	Nominal rating: 115 / 230 VAC Absolute min/max: 90-132 / 180-264 VAC		
Mains input freq.	45-63 Hz		
DISABLE	Discrete input signal. Active high. Disable voltage: +8VDC (typ.) >3.5VDC (min) <15VDC (abs max) Max sourcing current needed : 200uA Inhibit disable : Leave pin unterminated or put to GND <1.5VDC (max)		
IN+/-	0 - 1.51Vrms max (*2) Balanced audio input		
Input impedance (*3)	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Single ended input signal IN+ (CON1:9) Signal IN- (CON1:10) Ground Input impedance = 13k</p> <p>Input signal ground must also be connected to GND (CON1:7,8) to avoid large potential difference between ALC0300-1300 and source, since ALC0300-1300 is floating (not connected to protective earth).</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Balanced input signal IN+ (CON1:9) Signal+ IN- (CON1:10) Signal- GND (CON1:7,8) Signal Ground Input impedance + = 13k Input impedance - = 1k7</p> </td> </tr> </table>	<p>Single ended input signal IN+ (CON1:9) Signal IN- (CON1:10) Ground Input impedance = 13k</p> <p>Input signal ground must also be connected to GND (CON1:7,8) to avoid large potential difference between ALC0300-1300 and source, since ALC0300-1300 is floating (not connected to protective earth).</p>	<p>Balanced input signal IN+ (CON1:9) Signal+ IN- (CON1:10) Signal- GND (CON1:7,8) Signal Ground Input impedance + = 13k Input impedance - = 1k7</p>
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(*1) Mains AC input voltage range selectable with jumper.
Minimum startup voltage is 100VAC / 200VAC

(*2) At 230VAC mains input voltage. Maximum signal input voltage is given by output power rating factor, as described in the *Output Specifications*.

(*3) Signal source output impedance must be symmetrical for IN+ and IN- or and common mode rejection will be compromised. (see application notes for more information)

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	3 of 16

Output specifications:

Audio outputs (*1)	Max output voltage	Typ. cont. output power	Typ. output power FTC cond. (*2)	Max output power	Instantaneous peak output power	THD
OUT+/-	0 – 37.5Vrms	40W 4Ω	300W 4Ω	350W 4Ω 200W 8Ω	420W 4Ω 240W 8Ω	1%

(*1) Mains input voltage 115/230VAC. Output power of RMS load current. Due to the non-regulated nature of the internal PSU, the output power depends on the mains input voltage. Hence the power rating follows the equation: % Power change = (% voltage change)²

(*2) 1 hour pre heating with 1/8 of specified load and subsequently 5 min. with specified load at 120Vac, 1kHz input, T amb 25°C still air. Board mounted vertically.

AUX outputs (*1)	Nom. voltage	Voltage fluctuation		I Max cont.	Comments
		Min	Max		
AUX output supply voltage V1 : (STBY_DC)	+8VDC	+6.9VDC	+14.0VDC	20mA	
AUX output supply voltage V2: (VA+)	+14VDC	+7.5VDC	+16.5VDC	300mA (*2)	Max capacitive load 330uF
AUX output supply voltage V3: (VA-)	-14VDC	-7.5VDC	-16.5VDC	300mA (*2)	Max capacitive load 330uF

(*1) The ALC0300-1300 AUX outputs are unregulated and vary with load and AC input voltage. The AUX output supply voltage V1 (STBY_DC) is 10VDC while the unit is running and approximately 7.4VDC when in standby mode.

(*2) Maximum continuous output current on VA+ and VA- is in sum 600mA. This allows for any load combination between the two outputs in total giving 600mA, i.e. at most 600mA on one and 0mA at the other. This is not applicable for product revision G and earlier, where the individual load current may not exceed 300mA.

If these outputs are shorted a fuse (F200) blows and has to be replaced, see page 13.

Maximum load for Energy Star compliance

Compliance	Comment	STBY_DC	VA+/-	
Energy star	Maximum load (VA+ and VA-combined) to ensure <10W total idle consumption. Measured at 115/230VAC	20	150	mA

Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	4 of 16

Protections and functions:

Mains input fuse	T1.6AL (time lag) at 230VAC (upper AC voltage range) T3.15AL (time lag) at 115VAC (lower AC voltage range)
Over temperature protection	Power shut down by over temperature. Threshold temperature : 100(min) - 105(typ) - 110(max)°C Sensor connected to drain tab of high side power FET The shutdown time is short, only parts of seconds to start with, but increases as the module heats up. This is because when the temperature difference between the MOSFETs and the PCB is large, the MOSFETs will cool down very fast after shutdown, but as the PCB gets warmer it will take longer. This protection mode will be heard as very short interrupts to the sound.
Over voltage protection	Amplifier shut down during over voltage on output voltage rails. This can happen if the mains voltage exceeds the maximum rated level or during railpumping (due to DC on inputs or when generating subsonic frequencies). Immediately when the voltage has decreased the amplifier will start again. This protection mode will be heard as very short interrupts to the sound.
Over current protection	Threshold current : 17A (0.5Ω load, 1kHz burst). There are two modes of over current protection. 1. Constant current mode. The output will behave as during voltage clipping i.e. the output voltage will be cut off on the top to maintain an allowed current. 2. If the over current mode persists during a longer period (several periods of music) it is assumed that there is an error and the amplifier will shut down for a while and then restart.
Protection output status	Status output: CON2 pin "STATUS" Goes high during: 3. Over temperature shutdown 4. Over voltage shutdown Note that over current protection will not generate a STATUS flag.
Remote shut down to standby mode	Shut down input: CON2 pin 5 "DISABLE" Shut down by: Apply +8VDC (+3.5<V<+15VDC) on DISABLE input Normal operation : Leave pin unterminated or put to GND <1.5VDC
Rail pumping	At nominal mains voltage there is no problem to generate full span of power at 20Hz into 4ohm. The lower the frequency that is being generated the more the rails will be pumped (DC being the extreme where even a few hundred millivolts can cause over voltage shutdown).

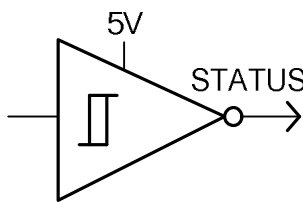
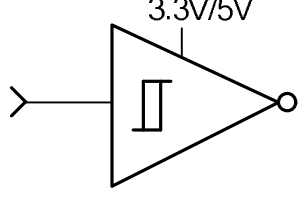
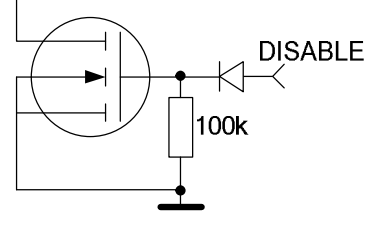
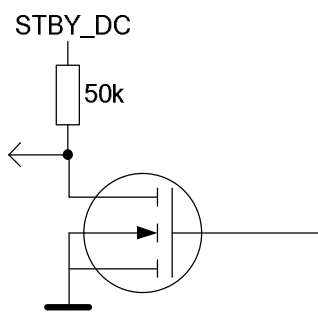
<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	5 of 16

Audio specifications:

Unless otherwise specified, the outputs are loaded with 4Ω.

Offset voltage (open inputs)	8mV typical (20mV max)
Switching frequency (idle)	390kHz typical (370-410kHz min-max)
Switching residual	1000mVpk typical
Recommended load	4Ω
Gain (f = 1kHz)	27.9dB typical
Idle noise	50uV (A-weighted 20Hz < f < 20kHz)
Upper BW limit (-3dB)	>60kHz
Lower power bandwidth limit	<20Hz (ALC0300 is guaranteed to deliver full power down to 20Hz)
Output impedance (100Hz)	4 mΩ typical
Residual noise vs freq	See figure 3
THD vs PWR	See figures 4-5
THD vs freq	See figure 6
Freq response	See figure 7

Proposed interfaces:

Input/output	ALC circuit	Proposed interface
STATUS (output) Goes high during over voltage conditions due to rail pumping or during amplifier over temp conditions.		
DISABLE (input) Pull up to STBY_DC to set the module in standby mode (power supply and amplifiers disabled). Leave floating or pull down to ground to enable.		

Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	6 of 16

CONNECTIONS

Mains connector	<p>CON2 : Quick Disconnect Tab TYCO 1-726388-2 CON3 : Quick Disconnect Tab TYCO 1-726388-2</p> <p>Suggested mating connector : Crimp Terminal TYCO 3-520412-2 or similar</p> <p><u>Pinning</u> CON2 : AC_L (Live) CON3 : AC_N (Neutral)</p>																										
Signal connector	<p>CON1 : 12pin 0.100" (2.54mm) header (Molex 2227-2121) Suggested mating connector : Molex KK series 2695-12 or similar Crimp terminal: Molex KK series 2759 or 4809</p> <table border="0"> <thead> <tr> <th data-bbox="517 882 794 909"><u>Pinning:</u></th> <th data-bbox="801 882 1418 909"><u>Description:</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="517 916 794 943">Pin 1 : STBY_DC</td> <td data-bbox="801 916 1418 943">AUX output voltage V1. (Standby voltage)</td> </tr> <tr> <td data-bbox="517 947 794 974">Pin 2 : VA+</td> <td data-bbox="801 947 1418 974">AUX output voltage V2 (+15V)</td> </tr> <tr> <td data-bbox="517 978 794 1005">Pin 3 : GND</td> <td data-bbox="801 978 1418 1005">Secondary side ground.</td> </tr> <tr> <td data-bbox="517 1010 794 1037">Pin 4 : VA-</td> <td data-bbox="801 1010 1418 1037">AUX output voltage V3 (-15V)</td> </tr> <tr> <td data-bbox="517 1041 794 1068">Pin 5 : DISABLE</td> <td data-bbox="801 1041 1418 1068">Standby input signal.</td> </tr> <tr> <td data-bbox="517 1072 794 1099">Pin 6 : STATUS</td> <td data-bbox="801 1072 1418 1099">Status output signal.</td> </tr> <tr> <td data-bbox="517 1104 794 1131">Pin 7 : GND</td> <td data-bbox="801 1104 1418 1131">Secondary side ground.</td> </tr> <tr> <td data-bbox="517 1135 794 1162">Pin 8 : GND</td> <td data-bbox="801 1135 1418 1162">Secondary side ground.</td> </tr> <tr> <td data-bbox="517 1167 794 1193">Pin 9 : IN+</td> <td data-bbox="801 1167 1418 1193">Audio channel positive input</td> </tr> <tr> <td data-bbox="517 1198 794 1225">Pin 10 : IN-</td> <td data-bbox="801 1198 1418 1225">Audio channel negative input</td> </tr> <tr> <td data-bbox="517 1229 794 1256">Pin 11 : N/A</td> <td data-bbox="801 1229 1418 1256">Not connected</td> </tr> <tr> <td data-bbox="517 1261 794 1288">Pin 12 : N/A</td> <td data-bbox="801 1261 1418 1288">Not connected</td> </tr> </tbody> </table>	<u>Pinning:</u>	<u>Description:</u>	Pin 1 : STBY_DC	AUX output voltage V1. (Standby voltage)	Pin 2 : VA+	AUX output voltage V2 (+15V)	Pin 3 : GND	Secondary side ground.	Pin 4 : VA-	AUX output voltage V3 (-15V)	Pin 5 : DISABLE	Standby input signal.	Pin 6 : STATUS	Status output signal.	Pin 7 : GND	Secondary side ground.	Pin 8 : GND	Secondary side ground.	Pin 9 : IN+	Audio channel positive input	Pin 10 : IN-	Audio channel negative input	Pin 11 : N/A	Not connected	Pin 12 : N/A	Not connected
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Pin 12 : N/A	Not connected																										
Loudspeaker connectors	<p>CON4 : Quick Disconnect Tab TYCO 0-726386-2 CON5 : Quick Disconnect Tab TYCO 0-726386-2</p> <p>Suggested mating connector : Crimp Terminal TYCO 3-520408-2 or similar</p> <table border="0"> <thead> <tr> <th data-bbox="517 1487 794 1514"><u>Pinning:</u></th> <th data-bbox="801 1487 1418 1514"><u>Description:</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="517 1520 794 1547">CON4 : OUT+</td> <td data-bbox="801 1520 1418 1547">Audio channel positive output</td> </tr> <tr> <td data-bbox="517 1552 794 1579">CON5 : OUT-</td> <td data-bbox="801 1552 1418 1579">Audio channel negative output</td> </tr> </tbody> </table>	<u>Pinning:</u>	<u>Description:</u>	CON4 : OUT+	Audio channel positive output	CON5 : OUT-	Audio channel negative output																				
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<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	7 of 16

MECHANICAL OUTLINE

Size (l x w x h)	120x154x50mm, see Figure 1. Board outline and dimensions below. Max component height/lead length on PCB bottom side: 4.0 mm
Mounting hole dia.	X2, X4, X100, X200 (plated): 3.5mm X1, X3 (non-plated): 4.0mm NOTE: The non-plated holes X1 and X3 are located on the primary side of the PSU circuitry and must be <u>insulated</u> when utilized. This typically means that nylon spacers/screws must be used when mounting the unit in an end application.
IP figures, encapsulation IP XY (X=Solids, Y=Liquids)	Open frame
Coloring, design and branding	ALC0300-1300, black PCB

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	8 of 16

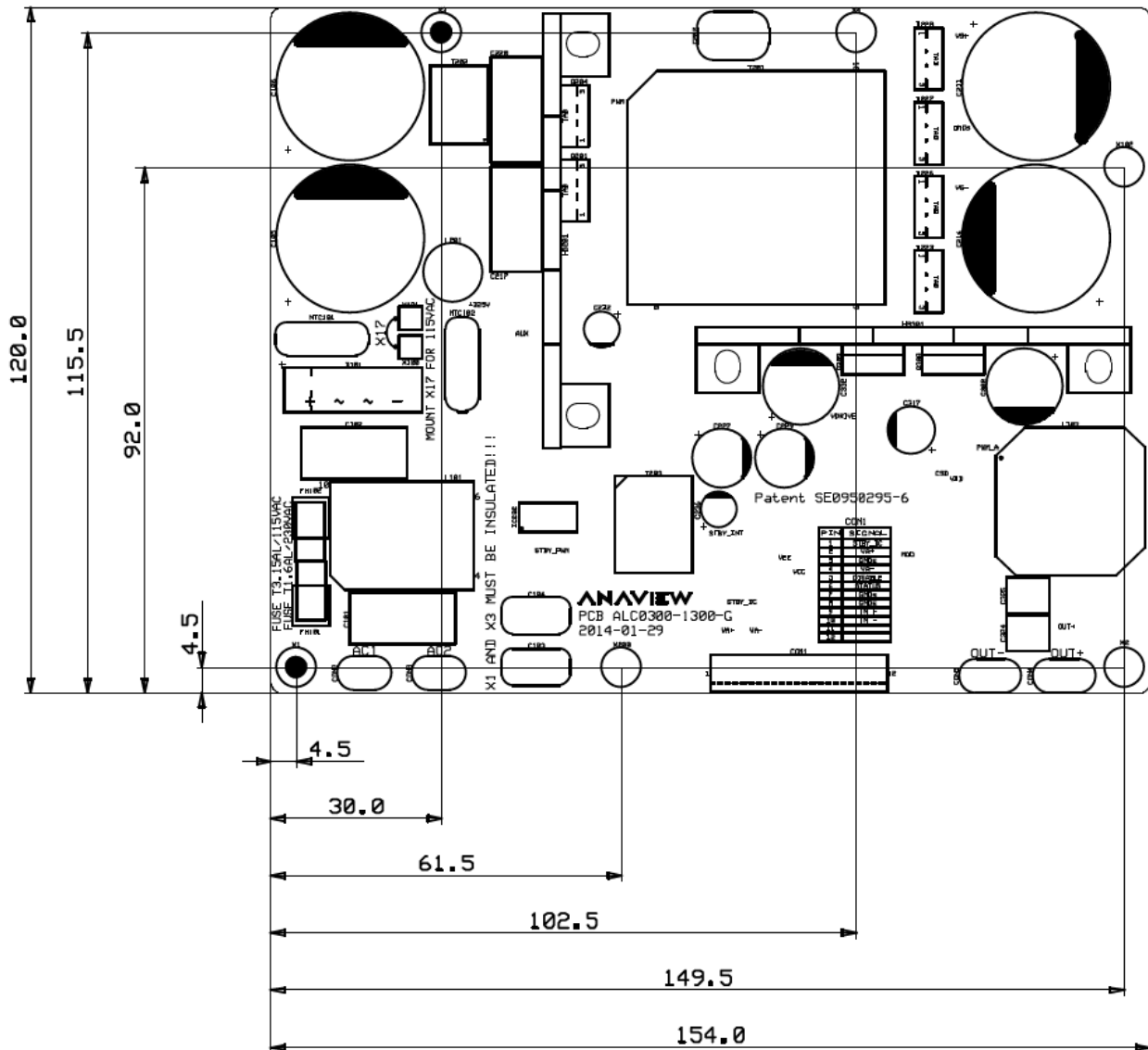


Figure 1. Board outline and dimensions.

Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	9 of 16

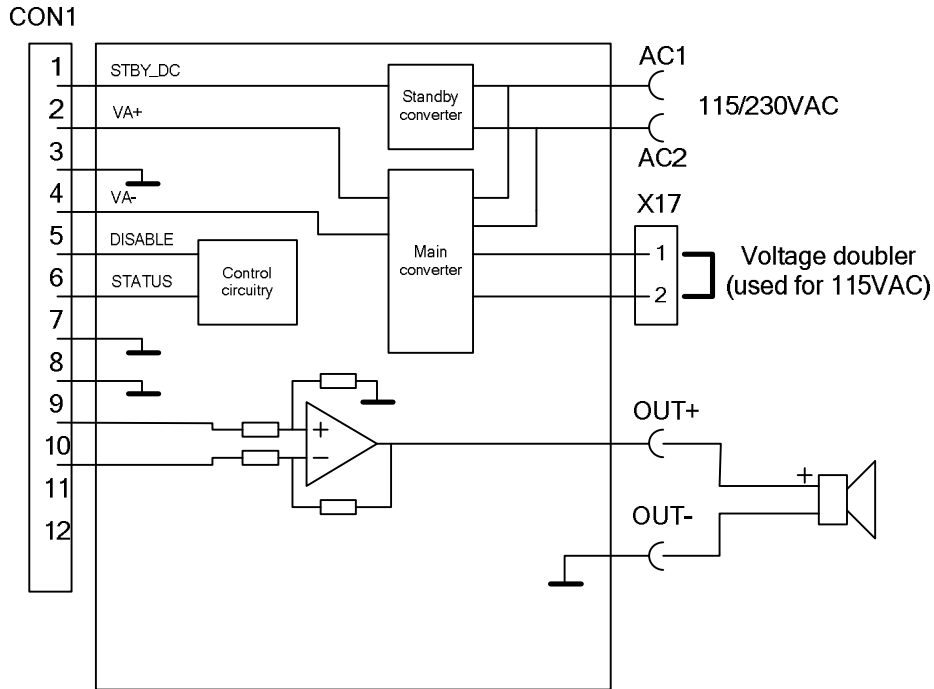


Figure 2. Block diagram amplifier.

Audio Precision

A-A FFT SPECTRUM ANALYSIS

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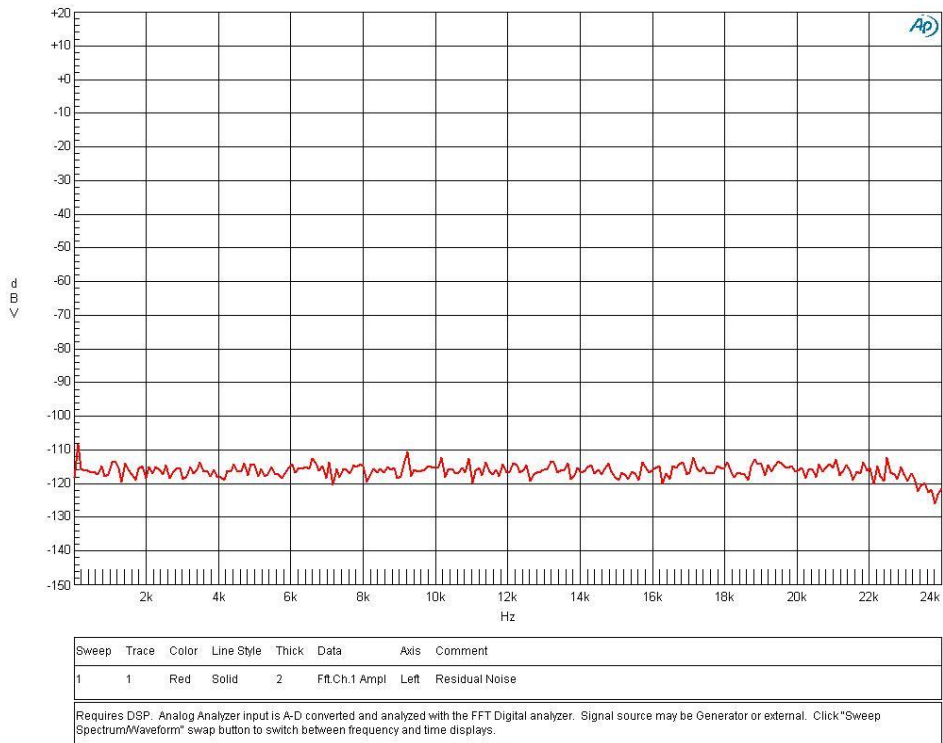


Figure 3. Residual Noise.

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	10 of 16

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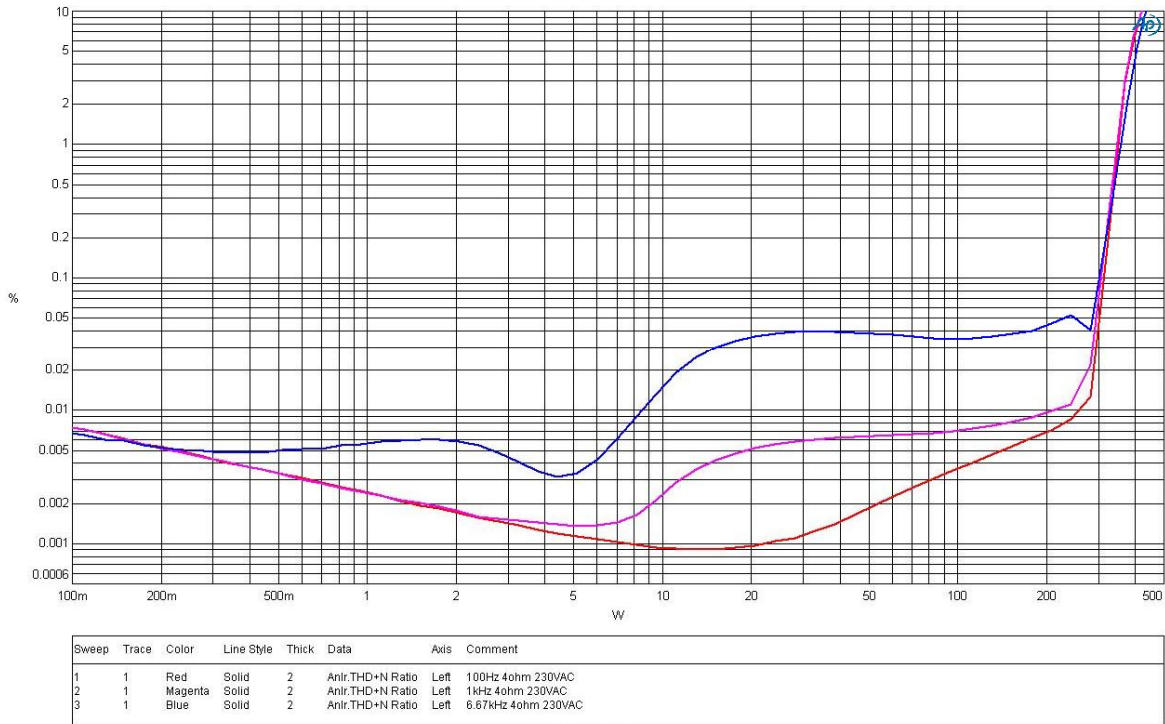


Figure 4. THD vs power, 4Ω 230VAC.

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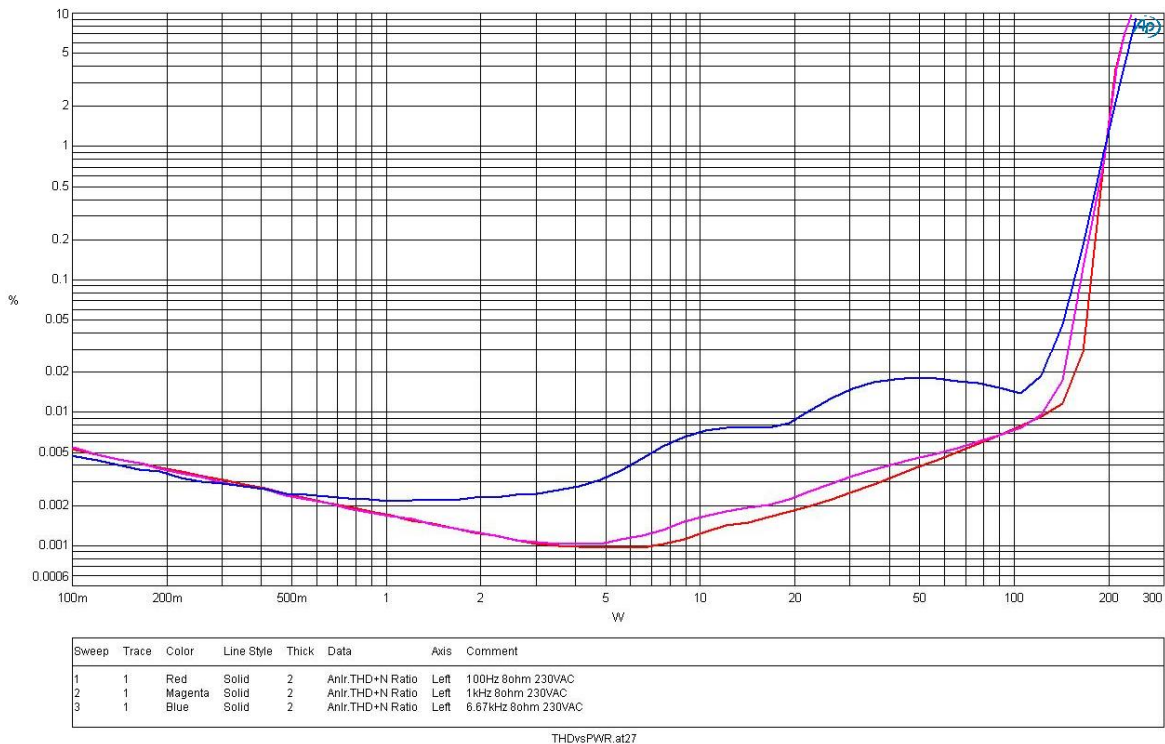


Figure 5. THD vs power, 8Ω 230VAC.

Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	11 of 16

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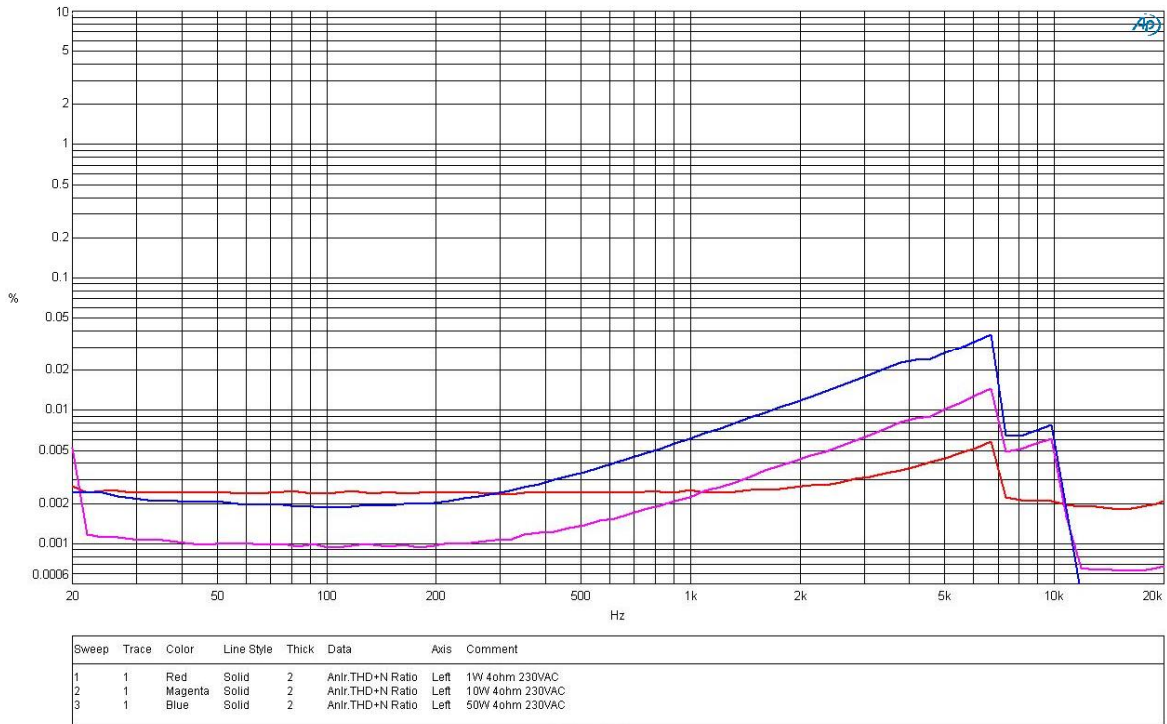


Figure 6. THD vs frequency, 4Ω 230VAC.

Audio Precision

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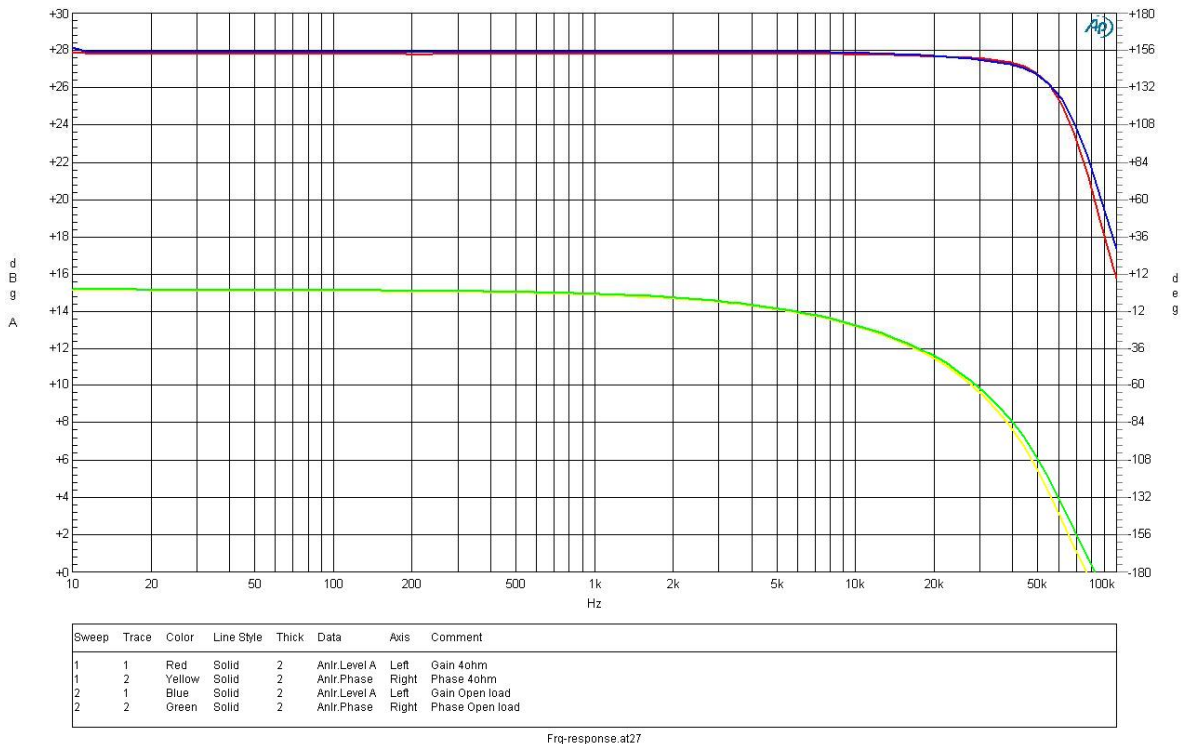


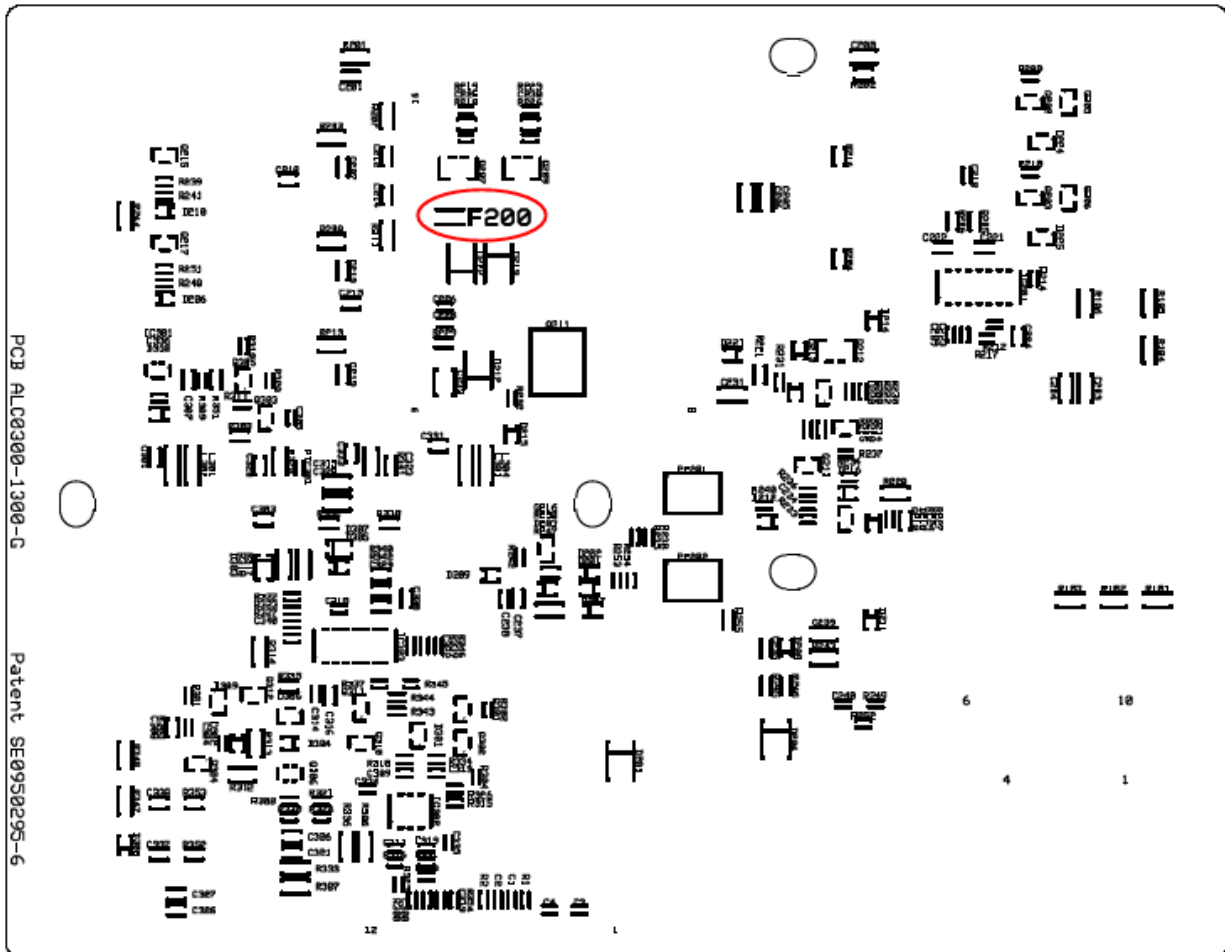
Figure 7. Frequency response.

Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	12 of 16

INSTRUCTIONS

Replacing the VA+/- fuse

The auxiliary supplies VA+/- are protected by a surface mounted fuse. In case of overload this fuse will open and has to be replaced to get the supplies back.



F200 is a 4A fuse from Littelfuse with article number 0440004.WR.

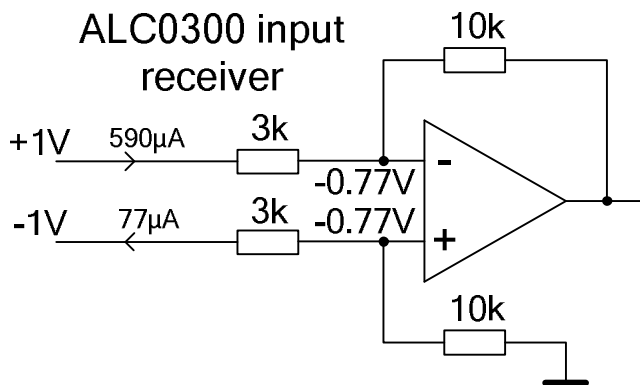
The maximum load on VA+/- can be seen in the table on page 4. The fuse value of 4A was chosen to tolerate the start-up charge energy of a capacitive load.

<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	13 of 16

APPLICATION NOTES

Optimizing input stage CMRR

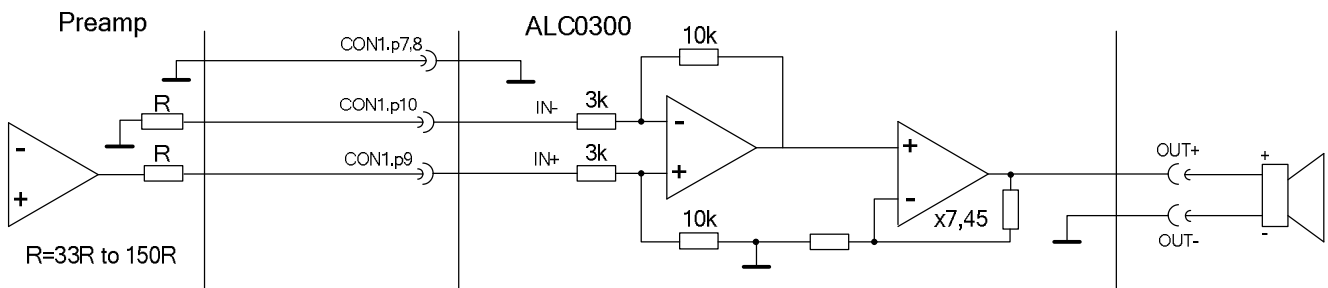
This is simplified drawing of the input of ALC0300. It is a typical circuit which is often used where the source impedance is well known and does not vary too much. Input currents are calculated when a balanced signal is applied. As can be seen the input impedance is not the same on both inputs and depending on which type of signal is applied (single ended or balanced) the input impedance changes.



This is however not a problem as long as a few precautions are made. Common mode rejection CMRR will be significantly improved by having the same source resistance on both the inputs.

Impedance balancing with single ended signal

Below is shown a setup with an impedance balanced single ended source. This requires a balanced cable.

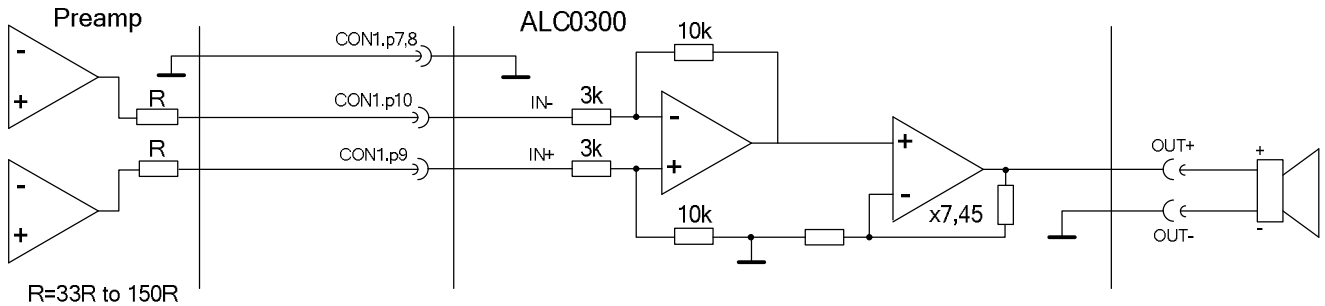


It is quite common to have a series resistance of 50ohm or more on the signal output so if the same resistance is placed in the opposite side of the signal of either sending or receiving side of the cable the CMRR rejection is intact.

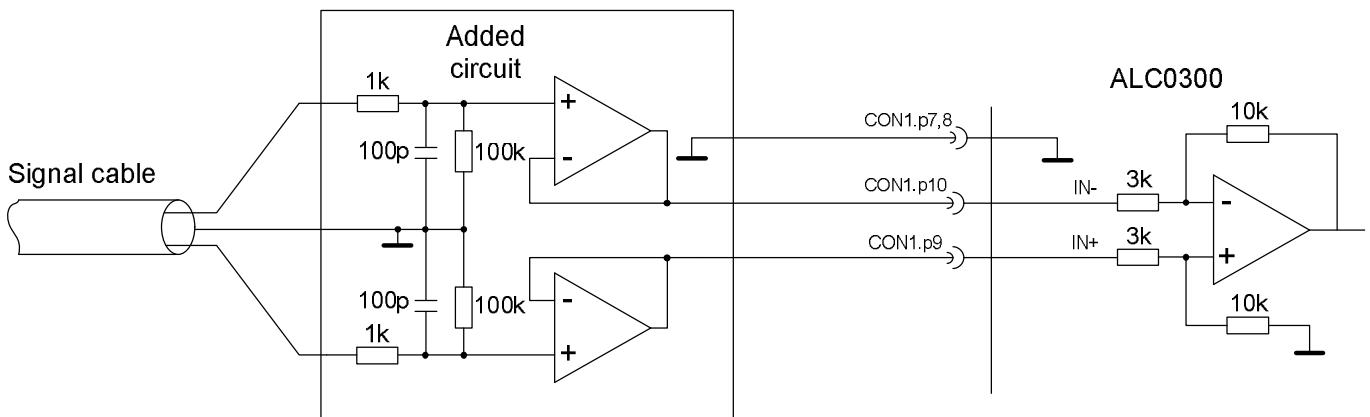
Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
Current Revision no.:	F1	Approved:	MC
Current Revision Date:	2014-07-08	Page Number:	14 of 16

Balanced input signal

If a balanced signal source is used the following setup applies.



If long cables are used the cable impedance itself can contribute in a non insignificant way to the series impedance and since that impedance is not very well defined (symmetrically) it can be an advantage to increase both the diff mode and common mode input impedance. In such a case an additional circuit as below can be added before the AMS module.



<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	15 of 16

REVISION LOG

Rev.	Date	Item	Sign
A	2010-01-14	<ul style="list-style-type: none"> - Revised description shut down mode input - Added IEC Protection Class - Updated Fig. 1 Board Layout and Dimensions 	KS
B	2010-06-24	<ul style="list-style-type: none"> - Revised mains input fusing data - Updated switching freq. and upper BW limit - Updated regulations and compliances table and added power loss conformity - Updated Fig. 1 "Board outline and dimensions" 	KS
C	2013-05-20	<ul style="list-style-type: none"> - Updated to Anaview Standards 	MD
D	2013-10-03	<ul style="list-style-type: none"> - Changed document name to PDS ALC0300-1300 according to Anaview standards - Revised contact information 	JN
E	2014-02-13	<ul style="list-style-type: none"> - Added application notes on input stage - Added information about VA+/- fuse - Added proposed interfaces for inputs/outputs - Added information in protection and audio specifications sections. - Changed PCB color to black. - Updated specs for VA+/- - Added specs for Energy Star compliance - Added info about input impedance in INPUT SPECIFICATIONS - Increased X1 and X3 diameter from 3.5mm to 4.0mm - Changed name of S101 to X17 - Updated EMC info 	PB JN
F	2014-06-13	<ul style="list-style-type: none"> - Updated thresholds in protections sections - Updated pictures in interfaces section - Updated information about VA+/- fuse 	PB
F1	2014-07-08	<ul style="list-style-type: none"> - Updated mounting hole information 	MC

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<i>Article Number:</i>	PDS ALC0300-1300	<i>Prepared:</i>	PB
<i>Document Date:</i>	2009-10-28	<i>Verified:</i>	MC
<i>Current Revision no.:</i>	F1	<i>Approved:</i>	MC
<i>Current Revision Date:</i>	2014-07-08	<i>Page Number:</i>	16 of 16