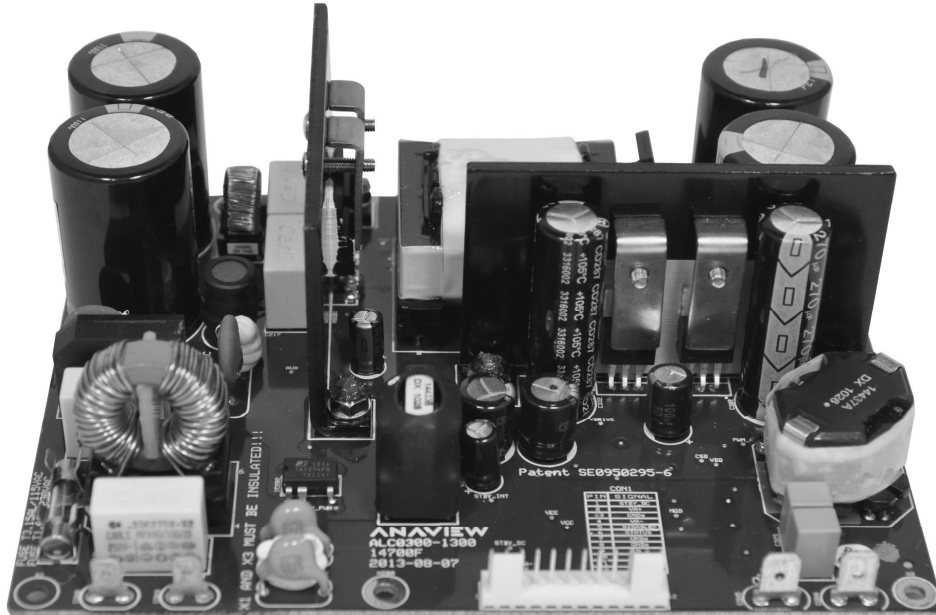


## PRODUCT DATA SHEET AUDIO LINE COMBINATION ALC0300-1300



### 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.

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## GENERAL

### *Environmental conditions*

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

### *Regulations and compliances*

<b>EMC</b>	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
<b>Safety</b>	LVD	IEC 60065:2001 + A1:2005 + A2:2010 EN 60065:2002 + A1:2006 + A11:2008 + A2:2010 + A12:2011 UL 60065 7 <sup>th</sup> Ed. Revised 2012-09-21 CAN/CSA C22.2 No. 60065-03, 1 <sup>st</sup> Ed., 2006-04 + A1:2006 + A2:2012	
<b>Power Loss</b>	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	

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## Miscellaneous product specifications

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

## ELECTRICAL SPECIFICATIONS

### Input specifications:

<b>Mains input voltage (*1)</b>	Nominal rating: 115 / 230 VAC Absolute min/max: 90-132 / 180-264 VAC	
<b>Mains input freq.</b>	45-63 Hz	
<b>DISABLE</b>	Discrete input signal. Active high. Disable voltage: +8VDC (typ.) >4VDC (min) <15VDC (abs max) Max sourcing current needed : 200uA Inhibit disable : Leave pin unterminated or put to GND <3VDC (max)	
<b>IN+/-</b>	0 - 1.51Vrms max (*2) Balanced audio input	
<b>Input impedance (*3)</b>	<b>Single ended input signal</b> IN+ (CON1:9) Signal IN- (CON1:10) Ground Input impedance = 13k  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).	<b>Balanced input signal</b> IN+ (CON1:9) Signal+ IN- (CON1:10) Signal- GND (CON1:7,8) Signal Ground Input impedance + = 13k Input impedance - = 1k7

(\*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 shall either be equal on both channels or there will be a difference in gain between the channels and common mode rejection will be compromised. (see application notes for more information)

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## 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)<sup>2</sup>
- (\*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.

## 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

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## ***Protections and functions:***

<b>Mains input fuse</b>	T1.6AL (time lag) at 230VAC (upper AC voltage range) T3.15AL (time lag) at 115VAC (lower AC voltage range)
<b>Over temperature protection</b>	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.
<b>Over voltage protection</b>	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.
<b>Over current protection</b>	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.
<b>Protection output status</b>	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.
<b>Remote shut down to standby mode</b>	Shut down input: CON2 pin 5 "DISABLE"  Shut down by: Apply +8VDC (+4<V<+15VDC) on DISABLE input Normal operation : Leave pin unterminated or put to GND <3VDC (max)
<b>Rail pumping</b>	At nominal mains voltage there is no problem to generate full span of power at 20Hz into 4ohm. The lower 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).

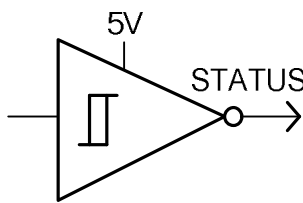
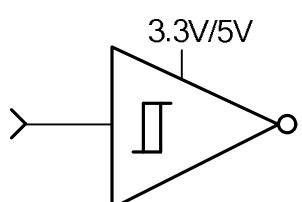
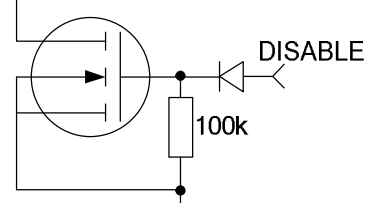
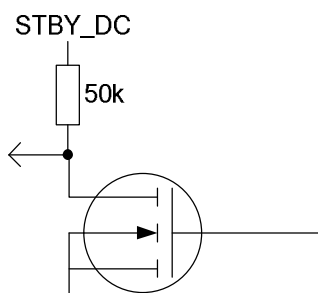
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## Audio specifications:

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

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

## Proposed interfaces:

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

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## CONNECTIONS

<b>Mains connector</b>	<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>																										
<b>Signal connector</b>	<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> <tr> <td><u>Pinning:</u></td><td><u>Description:</u></td></tr> <tr> <td>Pin 1 : STBY_DC</td><td>AUX output voltage V1. (Standby voltage)</td></tr> <tr> <td>Pin 2 : VA+</td><td>AUX output voltage V2 (+15V)</td></tr> <tr> <td>Pin 3 : GND</td><td>Secondary side ground.</td></tr> <tr> <td>Pin 4 : VA-</td><td>AUX output voltage V3 (-15V)</td></tr> <tr> <td>Pin 5 : DISABLE</td><td>Standby input signal.</td></tr> <tr> <td>Pin 6 : STATUS</td><td>Status output signal.</td></tr> <tr> <td>Pin 7 : GND</td><td>Secondary side ground.</td></tr> <tr> <td>Pin 8 : GND</td><td>Secondary side ground.</td></tr> <tr> <td>Pin 9 : IN+</td><td>Audio channel positive input</td></tr> <tr> <td>Pin 10 : IN-</td><td>Audio channel negative input</td></tr> <tr> <td>Pin 11 : N/A</td><td>Not connected</td></tr> <tr> <td>Pin 12 : N/A</td><td>Not connected</td></tr> </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
<u>Pinning:</u>	<u>Description:</u>																										
Pin 1 : STBY_DC	AUX output voltage V1. (Standby voltage)																										
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Pin 10 : IN-	Audio channel negative input																										
Pin 11 : N/A	Not connected																										
Pin 12 : N/A	Not connected																										
<b>Loudspeaker connectors</b>	<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> <tr> <td><u>Pinning:</u></td><td><u>Description:</u></td></tr> <tr> <td>CON4 : OUT+</td><td>Audio channel positive output</td></tr> <tr> <td>CON5 : OUT-</td><td>Audio channel negative output</td></tr> </table>	<u>Pinning:</u>	<u>Description:</u>	CON4 : OUT+	Audio channel positive output	CON5 : OUT-	Audio channel negative output																				
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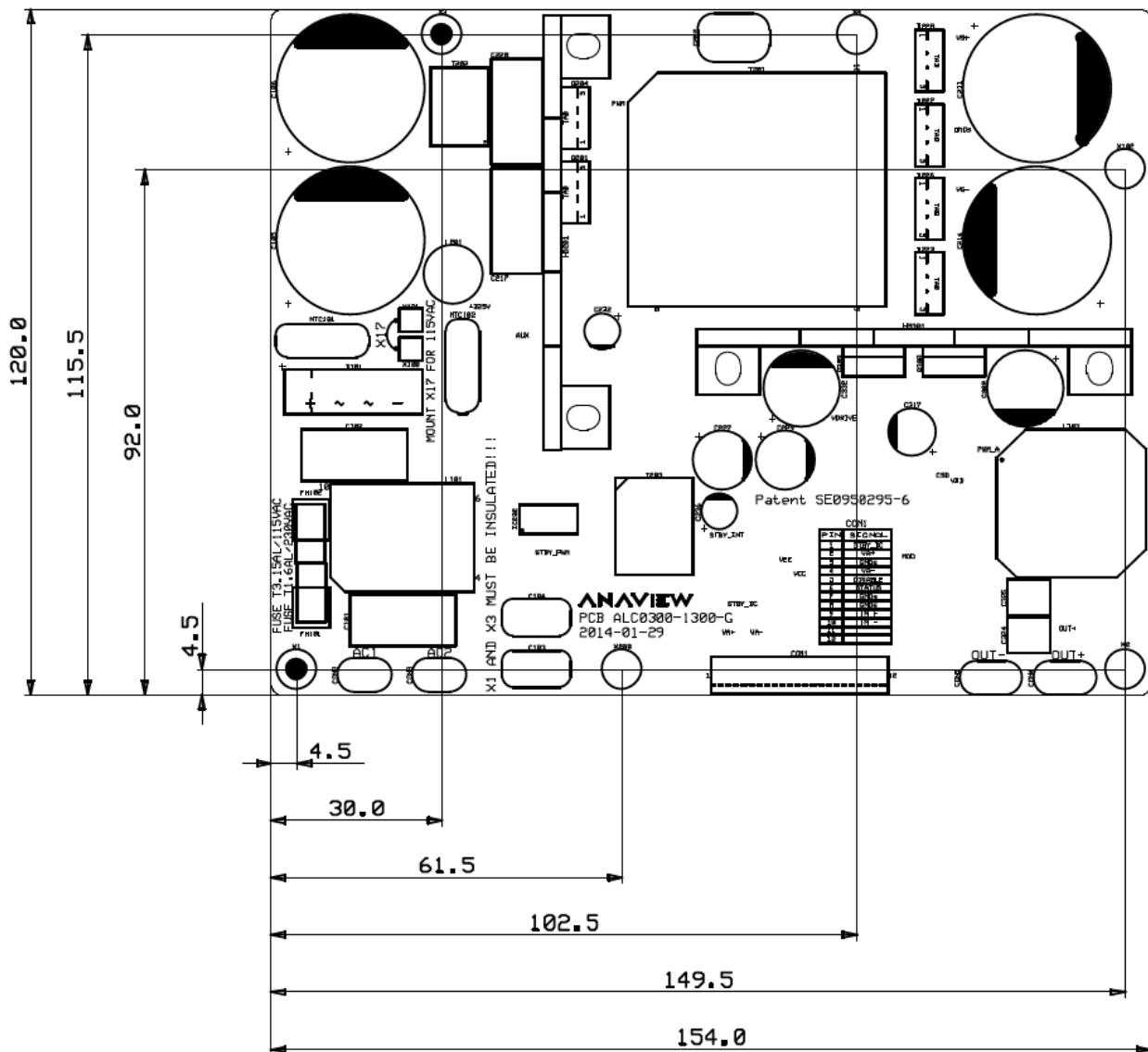


## MECHANICAL OUTLINE

<b>Size (l x w x h)</b>	120x154x50mm, see Figure 1. Board outline and dimensions below. Max component height/lead length on PCB bottom side: 4.0 mm
<b>Mounting hole dia.</b>	X2, X4, X100, X200 (plated): 3.5mm X1, X3 (non-plated): 4.0mm <b>NOTE:</b> 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, unless the connecting equipment is directly tied to Safety Earth (PE). This is due to the design compromise of getting minimum product volume on the benefit of insufficient safety creepage/clearance distance for these two holes.
<b>IP figures, encapsulation</b> IP XY (X=Solids, Y=Liquids)	Open frame
<b>Coloring, design and branding</b>	ALC0300-1300, black PCB

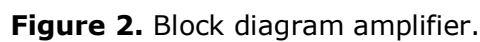
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**Figure 1.** Board outline and dimensions.

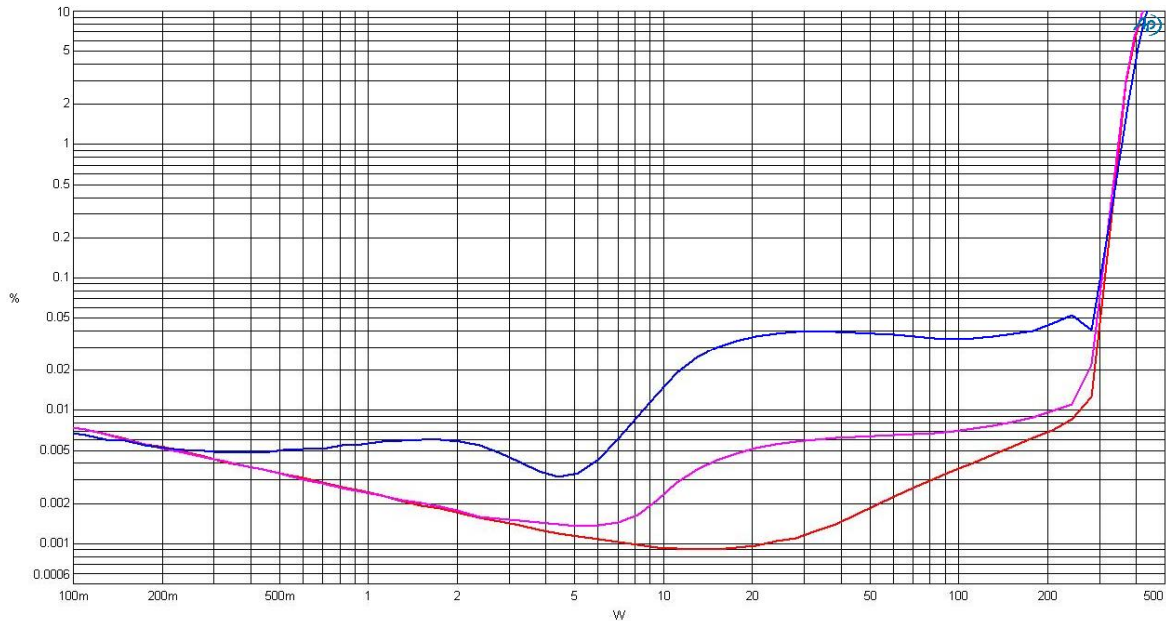
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Audio Precision

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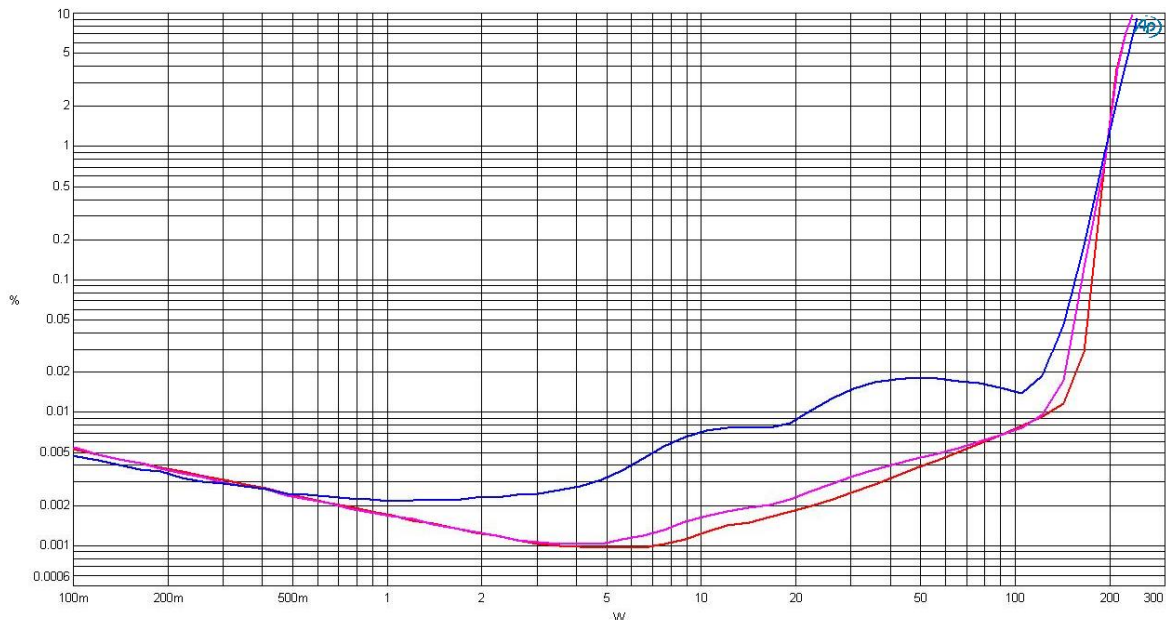
Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
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2	1	Magenta	Solid	2	Anlr.THD+N Ratio	Left	1kHz 4ohm 230VAC
3	1	Blue	Solid	2	Anlr.THD+N Ratio	Left	6.67kHz 4ohm 230VAC

THDvsPWR.at27

**Figure 4.** THD vs power, 4Ω 230VAC.

Audio Precision

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Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	2	Anlr.THD+N Ratio	Left	100Hz 8ohm 230VAC
2	1	Magenta	Solid	2	Anlr.THD+N Ratio	Left	1kHz 8ohm 230VAC
3	1	Blue	Solid	2	Anlr.THD+N Ratio	Left	6.67kHz 8ohm 230VAC

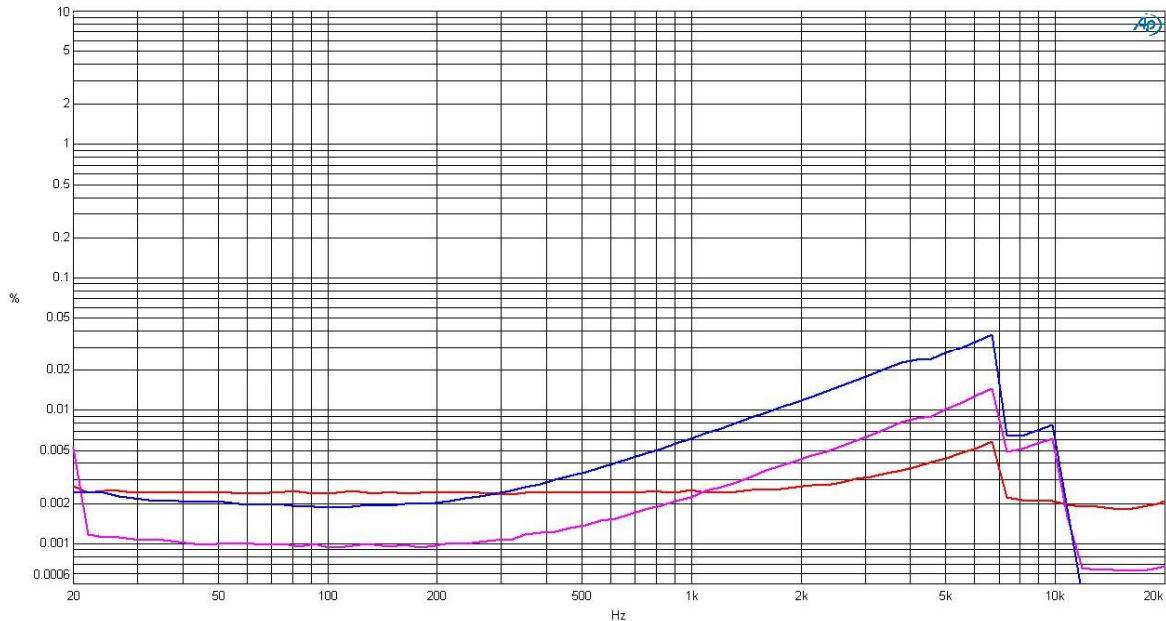
THDvsPWR.at27

**Figure 5.** THD vs power, 8Ω 230VAC.

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Audio Precision

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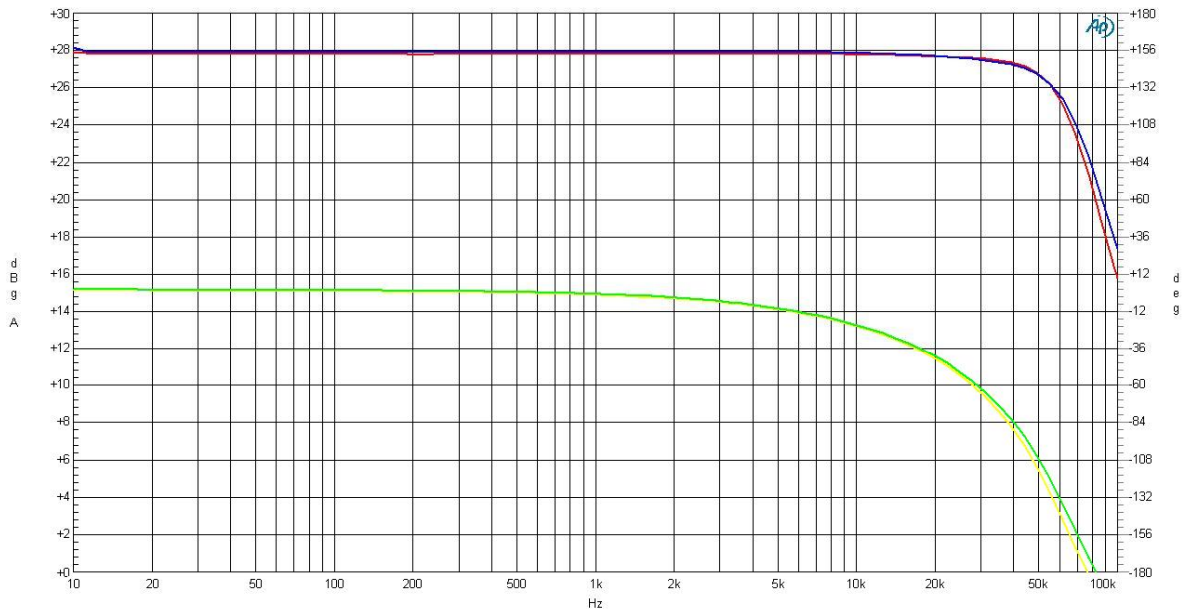
Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	2	Anlr.THD+N Ratio	Left	1W 4ohm 230VAC
2	1	Magenta	Solid	2	Anlr.THD+N Ratio	Left	10W 4ohm 230VAC
3	1	Blue	Solid	2	Anlr.THD+N Ratio	Left	50W 4ohm 230VAC

THDvsFRQ.at27

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

Audio Precision

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Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	2	Anlr.Level A	Left	Gain 4ohm
1	2	Yellow	Solid	2	Anlr.Phase	Right	Phase 4ohm
2	1	Blue	Solid	2	Anlr.Level A	Left	Gain Open load
2	2	Green	Solid	2	Anlr.Phase	Right	Phase Open load

Frq-response.at27

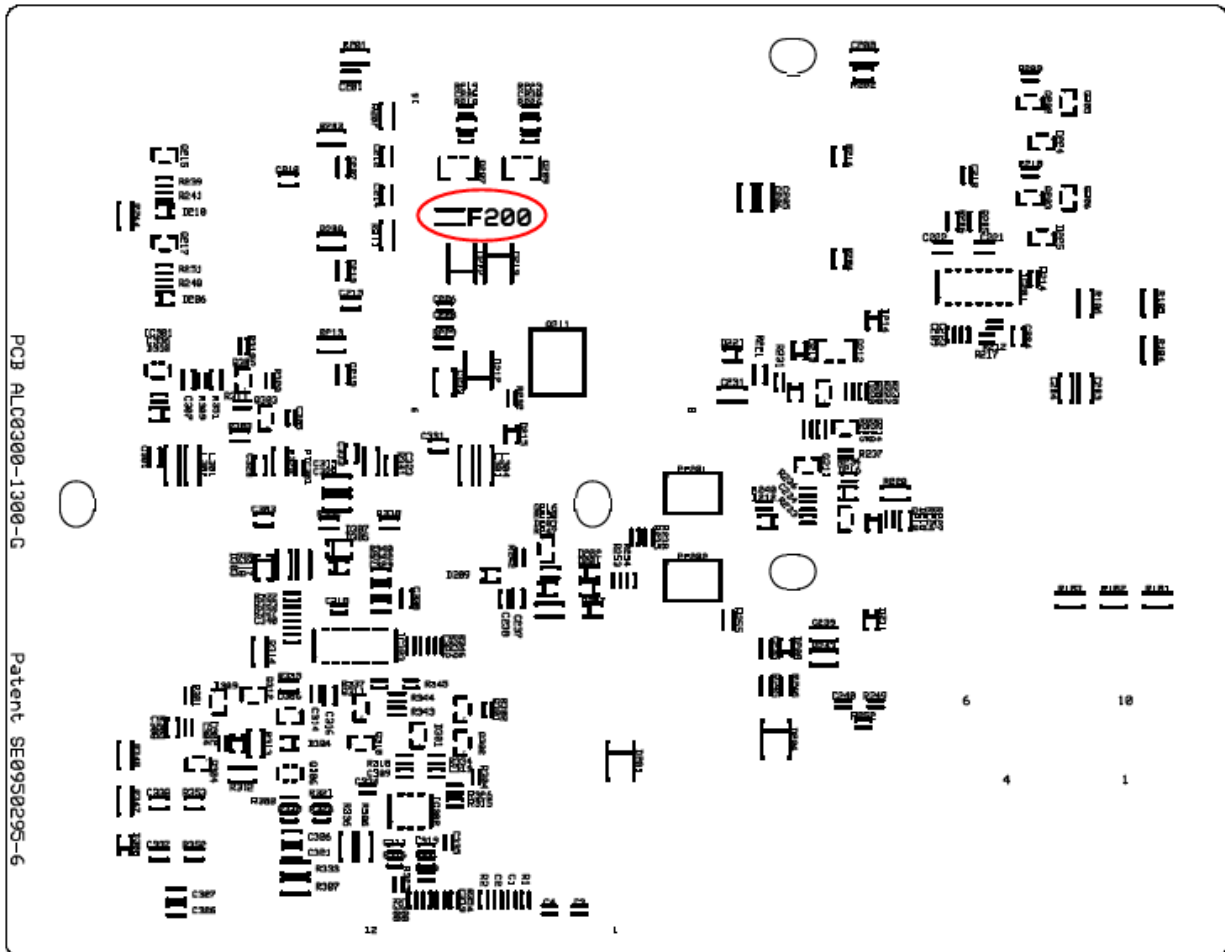
**Figure 7.** Frequency response.

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## 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.



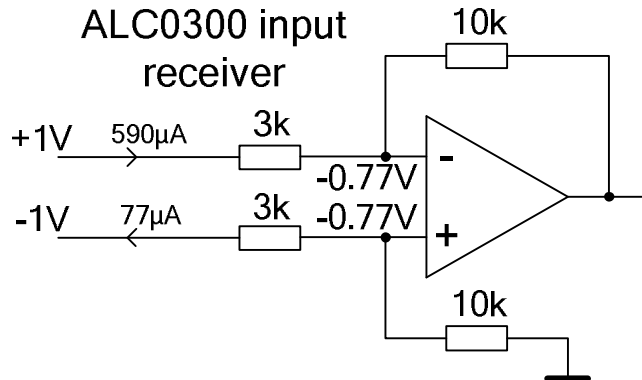
F200 is a 1.25A fuse from Littelfuse with article number 04401.25.

## 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.

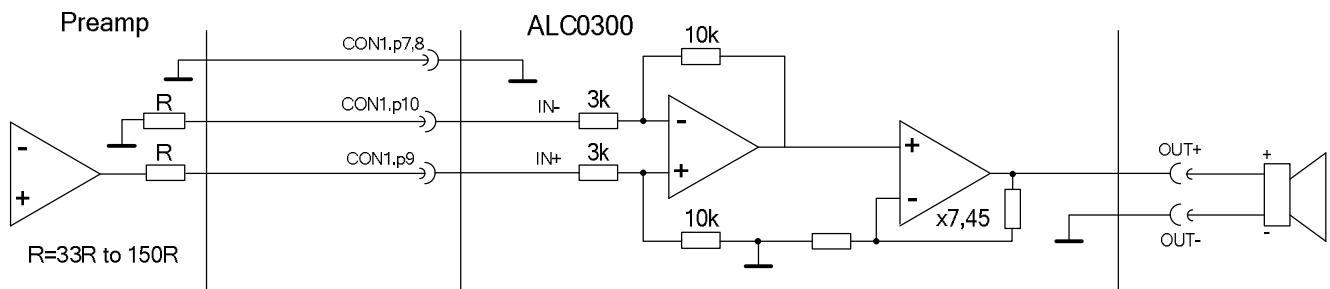
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This is however not a problem as long as a few precautions are made. Common mode rejection CMRR will be significantly improved by having the same source resistance on both the inputs.

## Impedance balancing with single ended signal

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

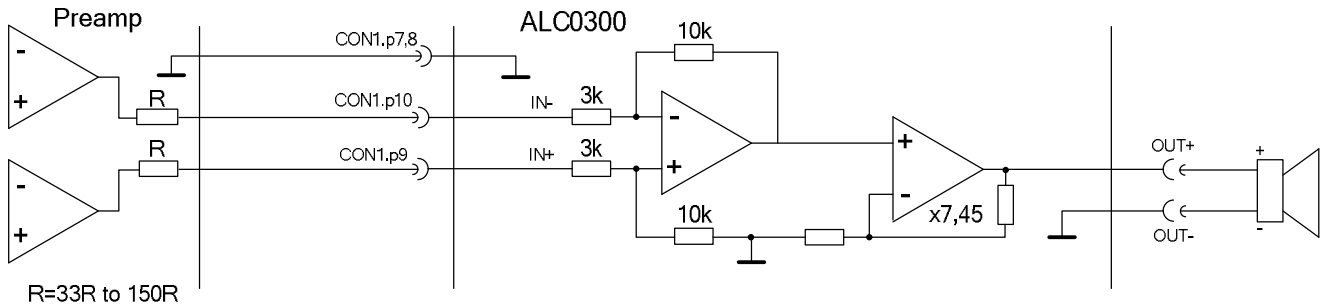


It is quite common to have a series resistance of 50ohm or more on the signal output so if the same resistance is placed in the opposite side of the signal of either sending or receiving side of the cable the CMRR rejection is intact.

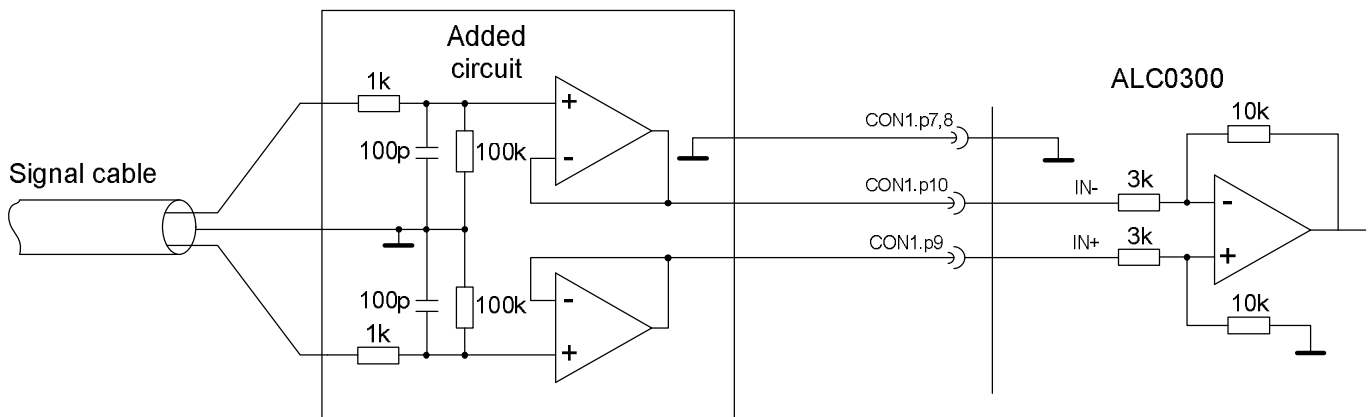
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## Balanced input signal

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.



Article Number:	PDS ALC0300-1300	Prepared:	PB
Document Date:	2009-10-28	Verified:	MC
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## REVISION LOG

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

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