

# GETTING STARTED WITH ANALOGIO-X8

## REVISION HISTORY

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## ABOUT ANALOGIO-X8

AnalogIO-x8 is an expansion board for Infinitas or any other freeDSP board with at least one I2S expansion header and supporting TDM streams. It adds 8 analog input channels and 8 analog output channels. The board provides the inputs and outputs on a Sub-D25 connector with Tascam pinout. All channels are balanced and designed for +6dBu @ full-scale.

The ADC part is based on the AKM AK5558, the DAC part is based on AKM AK4458. Both chips are providing state of the art conversion quality.

The expansion port provides the option to easily stack up two four boards and daisy chain them.

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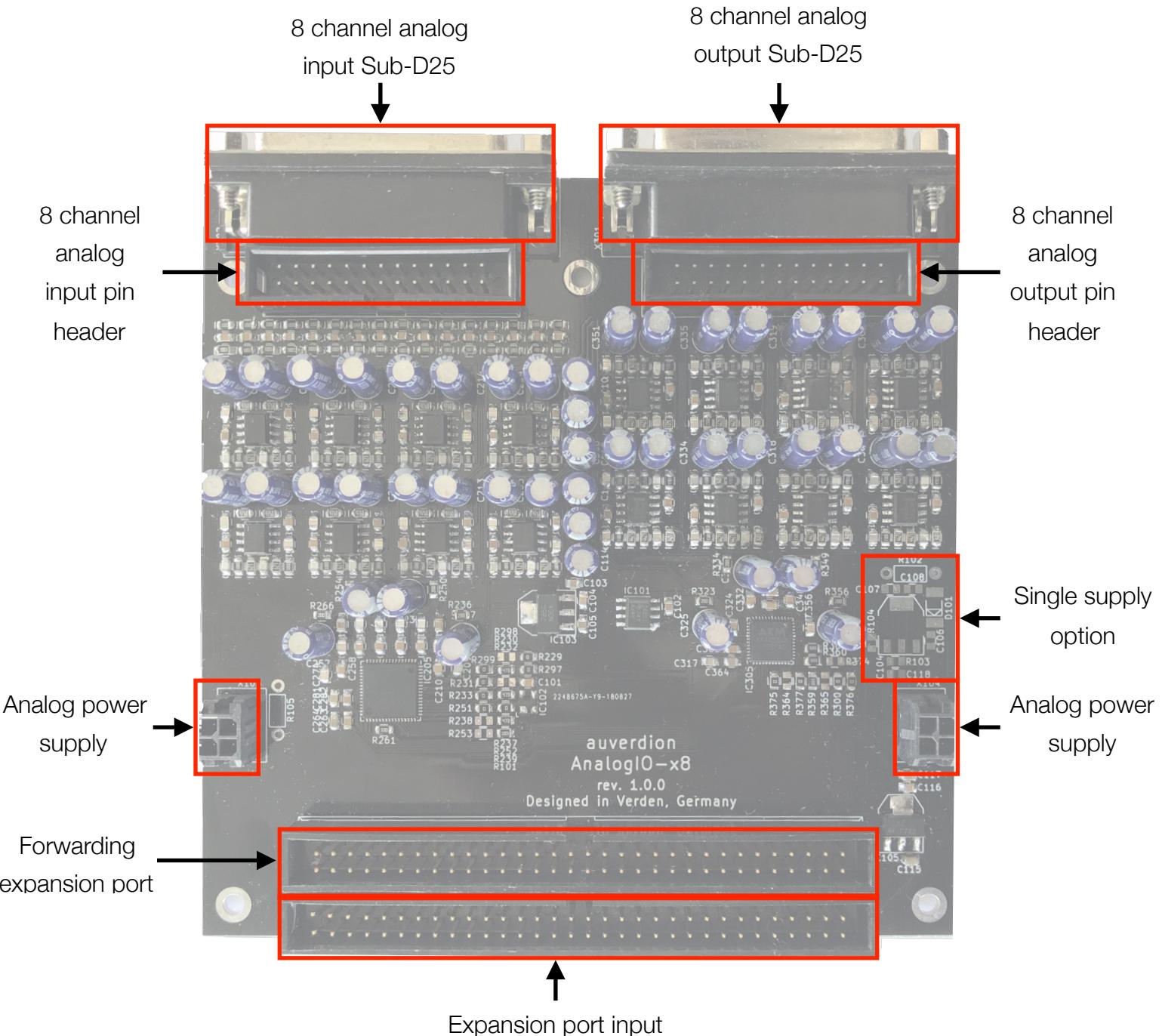
## IMPORTANT INFORMATION

The AnalogIO-x8 board might generate signals that may damage your audio equipment. Please read and understand this manual before starting to work with your board. Adjust all hardware settings and configure your software before connecting any audio equipment to AnalogIO-x8. Always start with low volume on your amplifier and slowly increase the level to reduce the risk of damaging your audio system.

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Please keep in mind that AnalogIO-x8 is an open-source spare-time project. Questions and new ideas can be discussed online with other DIYers. Please use the *Digital Line Level* subforum @ diyAudio.com or the *Truth Table* subforum @ groupdiy.com to connect with other people working with AnalogIO-x8 or Infinitas or freeDSP. Please create individual threads for your topics only if you cannot find your issue in the existing threads. Some questions can be answered by carefully reading this manual. We cannot provide individual support via email. Thank you for your understanding!

## OVERVIEW



# HOW TO GET ANALOGIO-X8 UP AND RUNNING

## GET EVERYTHING NEEDED

You will need a soldering iron with a fine tip plus some soldering experience to assemble the surface mounted and through hole components.

Order the AnalogIO-x8 kit. Sometimes centralized buying of PCB and all parts is offered on the forums. Please keep in mind that AnalogIO-x8 is a spare-time project. It may take some time until a new batch of boards and/or kits is offered.

- (a) Alternatively, order the PCB via [www.tindie.com](http://www.tindie.com). You will also need to order all electronic parts. The components can be ordered via DigiKey (or other distributors). This might be the fastest option.
- (b) Alternatively, you can manufacture your own circuit board or modify and extend the original design. This might be the most flexible option, but needs more expertise (and money) to get up and running.
- (c) Alternatively, manufacture the printed circuit board and order all parts yourself. You might want to locally organize centralized buying and board production together with some friends. You can find the necessary KiCAD files of the board on the freeDSP website [www.freeDSP.cc](http://www.freeDSP.cc). You will also need to order all electronic parts. The components can be ordered via DigiKey (or other distributors).

## SOLDER THE BOARD

You should start with soldering the most difficult part: The ICs. On youtube you can find tutorials how to solder the QFNs packages, e.g.

<https://www.youtube.com/watch?v=BvhE16vBfx4>

Then continue with all the other SMDs and finally solder the THT components. Always start with the components with lowest height.

## CONFIGURATION

The AnalogIO-x8 board supports both: Parallel and I2C control of ADC and DAC. The default configuration given in the tables in the schematic set both chips into I2C control mode because the MCU on the Infinitas board will configure them this way. Nevertheless, if your system does not provide the opportunity to control the board by I2C you can configure the ADC and DAC for stand alone operation by using the parallel mode. Please refer to the data sheets of AK4458 and AK5558 for the right configuration.

The AnalogIO-x8 board accepts +/-12V... +/-15V for the analog power supply. In case you only have a +12V supply coming from your freeDSP board you can mount the single supply option around IC104. In this case you need to populate R102 and R105 with 0R00.

## CONNECTIONS

AnalogIO-x8 was designed with having daisy chaining in mind. If you are using Infinitas you connect AnalogIO-x8 by a ribbon cable with 64 wires on connector X101. If you now want to add another AnalogIO-x8 board to the same port on Infinitas you connect X101 of the second board with X102 of the first board. This way you can stack up to four boards on each expansion port of Infinitas.

You can use the same stacking scheme for any freeDSP board supporting the I2S expansion header pinout. X101 and X102 provides the same pinout but four times in a row. AnalogIO-x8 only accepts TDM streams. 2 channel formats like I2S are not supported.

In case you don't want to use the Sub-D25 connectors you can connect your own connector board (e.g. with jacks, XLR...) on X201 and X302.

To simplify the distribution of +/-12V... +/-15V you can use X103 and X104 for daisy-chaining.

## APPENDIX

### PART LIST

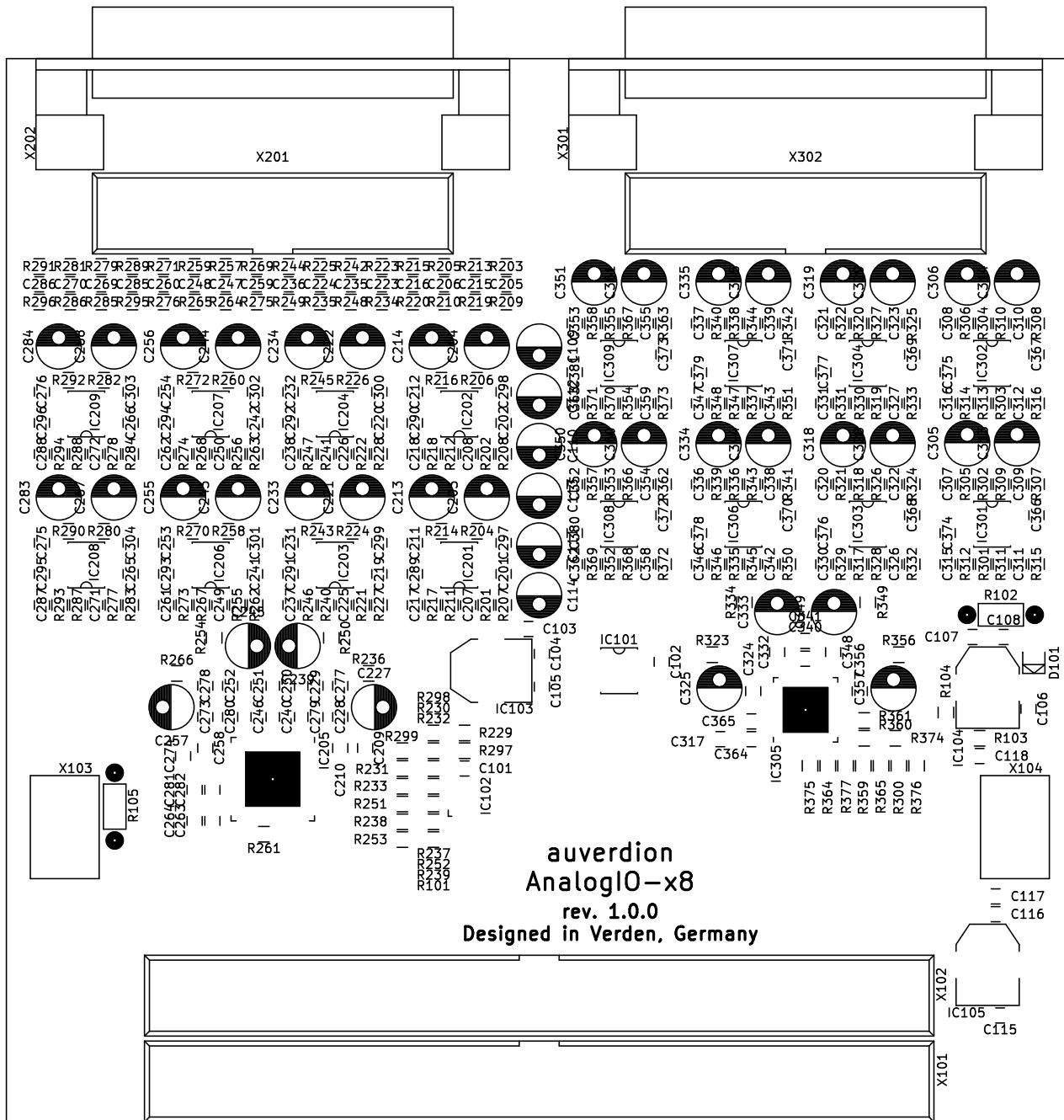
Reference	Qty	Value		Footprint	Order No. digikey
B101 B102 B103 B104 B105	5			MountingHol e_3.2mm_M3_ DIN965_Pad	
C101 C104 C107 C116 C228 C240 C246 C258 C263 C279 C280 C282 C289 C290 C291 C292 C293 C294 C295 C296 C297 C298 C299 C300 C301 C302 C303 C304 C324 C332 C340 C348 C356 C365 C366 C367 C368 C369 C370 C371 C372 C373 C374 C375 C376 C377 C378 C379 C380 C381	50	100n	5% 50V X7R	C0805-X7R	399-1170-1-ND
C102 C103 C105 C106 C108 C115 C117 C118 C277 C278 C341 C364	12	10u0	20% 25V X5R	C0805-X7R	490-10748-1-ND
C109 C110 C111 C112 C113 C114 C203 C204 C213 C214 C221 C222 C227 C233 C234 C239 C243 C244 C245 C255 C256 C257 C267 C268 C283 C284 C305 C306 C313 C314 C318 C319 C325 C328 C329 C333 C334 C335 C344 C345 C349 C350 C351 C357 C360 C361	46	100u	20% 25V	C_Radial_D5 _L11_P2	399-6102-ND
C201 C202 C211 C212 C219 C220 C231 C232 C241 C242 C253 C254 C265 C266 C275 C276	16	1n00	5% 50V PPS	C0805-X7R	PCF1328CT-ND

<b>Reference</b>	<b>Qty</b>	<b>Value</b>		<b>Footprint</b>	<b>Order No. digikkey</b>
C205 C206 C215 C216 C223 C224 C235 C236 C247 C248 C259 C260 C269 C270 C285 C286	16	1n00	10% 50V X7R	C0805-X7R	399-1147-1-ND
C207 C208 C217 C218 C225 C226 C237 C238 C249 C250 C261 C262 C271 C272 C287 C288	16	100p	5% 50V COG/ NPO	C0805-X7R	399-1122-1-ND
C209 C210 C229 C230 C251 C252 C273 C274	8	5n60	5% 16V PPS	C0805-X7R	PCF1193CT-ND
C264	1	4u70	20% 25V X5R	C0805-X7R	490-5422-1-ND
C281	1	10n0	10% 50V X7R	C0805-X7R	311-1136-1-ND
C307 C308 C315 C316 C320 C321 C330 C331 C336 C337 C346 C347 C352 C353 C362 C363	16	470p	2% 50V PPS	C0805-X7R	PCF1292CT-ND
C309 C310 C322 C323 C338 C339 C354 C355	8	27p0	5% 50V COG/ NPO	C0805-X7R	399-1114-1-ND
C311 C312 C326 C327 C342 C343 C358 C359	8	3n90	5% 16V PPS	C0805-X7R	PCF1191CT-ND
C317	1	1u00	10% 16V X7R	C0805-X7R	311-1365-1-ND
D101	1		MELF_Standar		
IC101	1	TLE2426ID	Spannungsref erenz	SOIC-8_3.9x 4.9mm_Pitch 1.27mm	296-1345-1-ND
IC102	1	ADM811TARTZ	Spannungsmon itor	SOT-143	ADM811TARTZ- REELCT-ND
IC103	1	LM1117MP-5.0	LDO	SOT-223	LM1117MP-5.0/ NOPBCT-ND
IC104	1	LM1117MPX-ADJ	LDO	SOT-223	LM1117MPX-ADJ/ NOPBCT-ND
IC105	1	NCP1117LPST33	LDO	SOT-223	NCP1117LPST33T 3GOSCT-ND

<b>Reference</b>	<b>Qty</b>	<b>Value</b>		<b>Footprint</b>	<b>Order No. digkey</b>
IC201 IC202 IC203 IC204 IC206 IC207 IC208 IC209 IC301 IC302 IC303 IC304 IC306 IC307 IC308 IC309	16	NE5532AD	OpAmp	SOIC8_3.9x4 .9mm_Pitch1 .27mm	NE5532AD8R2GOS CT-ND
IC205	1	AK5558VN	ADC	QFN64_9x9mm _Pitch0.5mm _EP_Handsol dering	974-1128-1-ND
IC305	1	AK4458VN	DAC	QFN48_7x7mm _Pitch0.5mm _EP_Handsol dering	974-1082-1-ND
R101 R209 R210 R219 R220 R234 R235 R248 R249 R264 R265 R275 R276 R285 R286 R295 R296	17	100K	1% 0.125W Thick	C0805-RES	311-100KRCR- ND
R102 R105	2			Resistor_Ho rizontal_RM 7mm	
R103 R305 R306 R312 R314 R321 R322 R329 R331 R339 R340 R346 R348 R357 R358 R369 R371	17	150R	1% 0.25W Thin	C0805-RES	RNCP0805FTD150 RCT-ND
R104	1	931R	1% 0.125W Thick	C0805-RES	311-931CRCT-ND
R201 R202 R211 R212 R221 R222 R240 R241 R255 R256 R267 R268 R277 R278 R287 R288	16	620R	0.5% 0.1W Thin	C0805-RES	RR12P620DCT-ND
R203 R205 R213 R215 R223 R225 R242 R244 R257 R259 R269 R271 R279 R281 R289 R291	16	100R	1% 0.25W Thin	C0805-RES	RNCP0805FTD100 RCT-ND
R204 R206 R214 R216 R224 R226 R243 R245 R258 R260 R270 R272 R280 R282 R290 R292	16	976R	0.5% 0.1W Thin	C0805-RES	408-1761-1-ND

<b>Reference</b>	<b>Qty</b>	<b>Value</b>		<b>Footprint</b>	<b>Order No. digikey</b>
R207 R208 R217 R218 R227 R228 R246 R247 R262 R263 R273 R274 R283 R284 R293 R294	16	10R0	1% 0.25W Thick	C0805-RES	RNCP0805FTD10R 0CT-ND
R229 R231 R233 R251 R252 R253 R297 R299 R300 R359 R360 R361 R364 R365 R375 R376 R377	17	0R00	1% 0.125W Thick	C0805-RES	311-0.0ARCT-ND
R236 R250 R254 R266 R323 R334 R349 R356	8	20R0	1% 0.125W Thick	C0805-RES	311-20.0CRCT- ND
R261	1	51R0	1% 0.125W Thick	C0805-RES	311-51.0CRCT- ND
R230 R232 R237 R238 R239 R298 R374	7	47K0	1% 0.125W Thick	C0805-RES	311-47.0KCRC- ND
R301 R303 R311 R313 R317 R319 R328 R330 R335 R337 R345 R347 R352 R354 R368 R370	16	4K42	0.5% 0.1W Thin	C0805-RES	RR12P4.42KDCT- ND
R302 R304 R315 R316 R318 R320 R332 R333 R336 R338 R350 R351 R353 R355 R372 R373	16	3K40	0.5% 0.1W Thin	C0805-RES	RR12P3.4KDCT- ND
R307 R308 R309 R310 R324 R325 R326 R327 R341 R342 R343 R344 R362 R363 R366 R367	16	4K70	1% 0.125W Thin	C0805-RES	YAG3364CT-ND
X101 X102	2	IDC64	Pfostensteck er	IDC64	ED10532-ND
X103 X104	2	MicroFit3 02x02	Stiftleiste	Microfit3_4 3045-0428	WM10670-ND
X201 X302	2	IDC26	Pfostensteck er	IDC_Header_ Straight_26 pins	377-2269-ND
X202 X301	2	DSUB25F	gewinkelt	DSUB25FC	AE10937-ND

## ASSEMBLY PRINT



auverdion  
AnalogIO-x8  
rev. 1.0.0  
Designed in Verden, Germany



## SCHEMATIC

