ELTIM high-end Buffer/converter modules

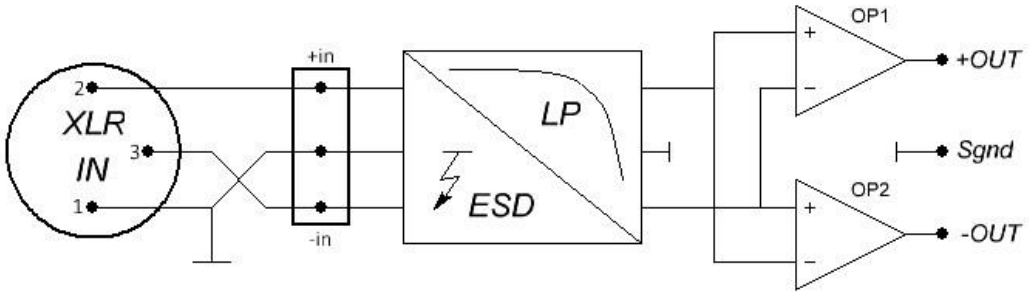
updated February 21th, 2020

BinBout-128x XLR balanced in > balanced out buffer module

With this module we provide a tiny circuitry with a Balanced (XLR) input which is buffered in two counter phase balanced signals. It can be directly mounted in a panel or used internally.

- **Buffer your balanced input(s), protect for ESD, remove line unbalances and block interfering signals.**
- **More interesting: this tiny module provides the correct signals required for operating a stereo amplifier in bridged mode. While using it, CMRR is at a remarkable high level of 90dB.**

With the THAT 128x chip as we use here, we buffer a balanced XLR input signal and you obtain an extremely good balanced signal for internal use with an amazing voltage swing capability up to 15Vrms into 600 ohms!
The input is double ESD safe and LC-filters block possible RF-interference. The input connector is a high quality gold plated XLR female connector.
The RF-blocking parts are mounted immediate after this connector. Since the required (laser trimmed) resistors around the opamps are in the IC already, the schematics as well as the PCB look very simple indeed.
All parts other than the IC are input filtering and power supply (SMD) parts. Due to different IC models with different resistor values, we can supply versions with 0dB, -3dB and -6dB gain. The module is connected by a 6-pole screw terminal.



Both balanced input signals flow via ESD- and filtering parts preventing any mishap while connecting it and/or use it in a strong RF-interfered area. Then the signals are buffered by very high quality Opamps, both present in the THAT128x IC. Besides these opamps there are also 8 laser trimmed resistors in the IC. The precision of these resistors define the balance quality of the signals. These resistors are trimmed within ±0,005%, the only way to reach a CMRR ratio of 90dB as this IC performs. With regular resistors and IC's this is, also due to the PCB/parts inductive/capacitive behaviour and way too high tolerances by far not as good as with our solution.
Due to its buffer function with very high quality output stages, the output impedance is known and stable. The output Z is very low and it can handle 300pF line capacitance. Due to this also long cables can be used. The balanced signal can be used to feed electronics with balanced inputs, like a (pre)amplifier, DSP or ADC.

We guess it will mostly be used in bridged mode amplifiers though. Why is explained at the next page. Several Class-D manufacturers provide amp modules where exactly the function of our BinBout-128x is missing!

THAT IC's are used in the most expensive mastering equipment, due to their transparent behaviour.

Power Supply

There are power supply connections (+12V and -12V) for use in low voltage applications, ± 4 - 13V.
If you persist in using voltages around ±14-18V, remove the 15V zenerdiodes, since these lines are paralleled by 15V Zener diodes which will draw severe currents otherwise! The IC itself can handle voltages up to ±18V.

Since this module will be used in power amplifiers as well, higher PS voltages can be applied to the extra V+/V- pins in the range of ±18 - 75Vdc. These are then connected to the power amps power supply rails.
15mA Constant Current Diodes (CCD) provide a constant current over this wide voltage range. Then the 15V zener diodes regulate the internal supply to ±15Vdc. 6mA flows into the IC, the other 9mA via the zeners.

Mounting

This module is available with the gold plated, female (MC916G) XLR input connector, with a chassis drill hole of Ø 22mm. Since this PCB hardly has any weight, mounting the XLR female connector to the cabinet chassis is sufficient.
For internal use we now also can supply a version with all screw terminals.
Then the module is mounted with a single M3 bolt.
The internal output and power supply connections are via a 6-pole screw terminal at the other end of the double sided (2x 35um) PCB.
We use uncommonly wide tracks, far wider than we see everywhere else.
Also, about ¾ of the available copper is grounded for best noise figures.
Note that supply- and signal ground are separated. You can connect them via two solder pads.

Models

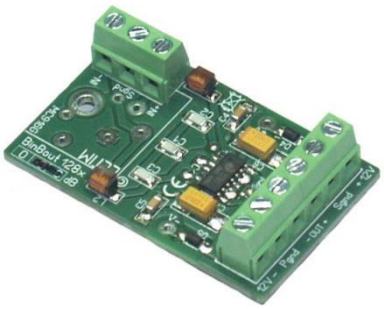
We provide versions with different amplification values:
0dB (mostly 1Volt, Hifi/High-End), -3dB (2 Volt, some ref. eq.) and -6dB (4 Volt line signal, mostly P.A.).
Normally we supply the 0dB variant, -3/-6dB on request. Its just a matter of IC type mounted.
For further explanation of the functioning we like to refer to the datasheet of this THAT 128x IC.

- ELTIM BinBout-1280 XLR Balanced in/balanced out with 0dB gain
- ELTIM BinBout-1283 XLR Balanced in/balanced out with -3dB gain
- ELTIM BinBout-1286 XLR Balanced in/balanced out with -6dB gain

We add an extra letter indicating the type of connector: X = XLR S = screw.

Some figures

Input impedance:	BinBout-1280:	9,0 kohms
	BinBout-1283:	10,5 kohms
	BinBout-1286:	12,0 kohms
Output impedance:	50 ohms	
Max. capacitive load:	300pF	
Max voltage swing:	V power supply -2,5V (27,5dBu max)	
Frequency range:	> 7,5MHz.	
Slew rate:	> 15V/uS	
Distortion:	< 0,0006% THD	
Noise figure:	< 104dBu	
CMRR:	> 90dB @60Hz under all circumstances	
Power supply voltage:	± 3 - 13V @ ±12V connections, 6mA	
High voltage supply:	± 18 – 75Vdc @ +V/-V connections, 15mA	
Dimensions	55x34x27mm (LxWxH)	



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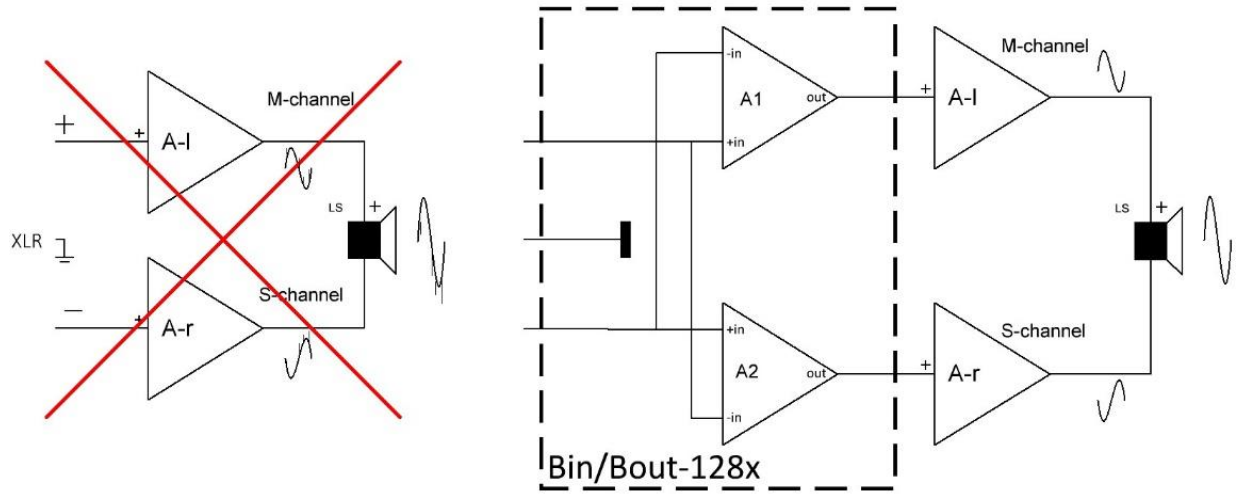
Bridged mode amplifiers appendix

A specific way of connecting a stereo amplifier where about quadruple power is available is called bridge mode. By feeding an inverted input signal to the slave amplifier, the double output voltage is available and so (theoretically) a double current is flowing. Then, **Pout= 2 U * 2 I**, so quadruple power compared to a single amplifier. In practice the output will be a little less than this theoretical 4x figure due to extra losses.

One could say that these counter phase signals are already available in a balanced (f.e. XLR) signal. One amp is connected to pin 2 and the other to pin 3 of the XLR connector. This is amazingly often used in even expensive equipment. Doing so, you have a bridged amp indeed, but the advantage of a balanced signal, being free from external disturbing signals, is totally messed up and both amps need to process these disturbing signals, see the scope pictures in this drawing. CMRR will also be very bad. Line unbalances are passed on and amplified! Also, DC levels, as often present, could be passed multiplied to the speaker outputs if it's a DC amp like ours.

While using this module, it's done in a way better manner, maintaining a noise free signal and 100% balanced signal. While using the ELTIM BinBout-128x, wiring of a bridged mode amplifier looks like this:



Common "Bridged" mode amplifier ELTIM Bin/Bout-128x wiring diagram

The left picture shows most commonly used for bridging a stereo amplifier, but this is not only quadrupling power, but also passing the sparks, RF interference, etc. all also doubled in size!
To us it is very strange that this wiring is even seen in High-End designs. It's simply wrong.
Wiring it like this could be audible if there is a noisy environment and at high volumes you amp could even go in clipping. Especially your tweeters won't like that at all……. Neither will your ears and wallet.
At least your feedback system in your power amp won't like it, which will be audible as well.

Our module balances both signals for both power amps again and so due to the phase inversion filters out all the possible mess on the signal line, leaving a clean signal for the power amplifiers.

While wiring the amp as in the picture above, available power will be around 3,5x the single channel power. BUT: make sure that the Power Transistors and Power Supply can handle this extra power. Current DOUBLES ! Due to this fact, in most cases you can only use 8ohms speakers here.

While rewiring a stereo amplifier into a bridged mode amplifier, a single speaker system is then connected between both speaker + terminals of the amplifier. The speaker – terminals are NOT used any more.