ELTIM high-end Buffer/Converter modules

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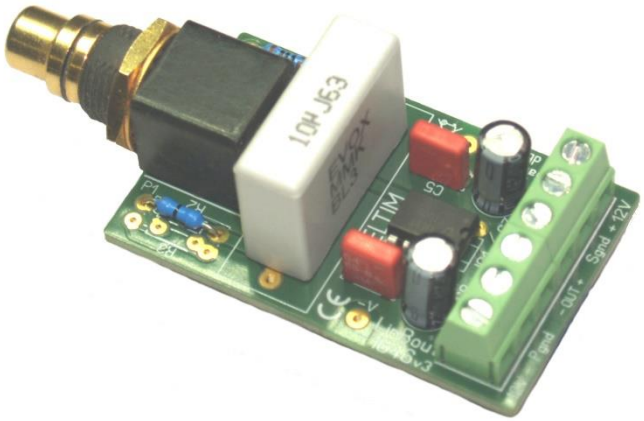
Lin/Bout-1646 v2 Professional RCA Line > prof. balanced module

With this module we provide a tiny circuitry with a Line input which is converted in two counter phase signals in a most professional way. It can be directly mounted in a panel with a single nut.

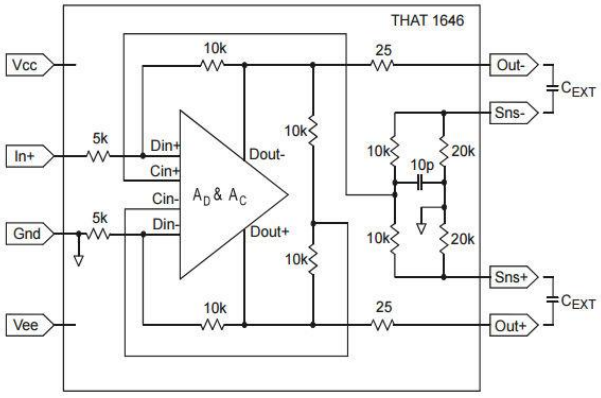
- **Converts your line input(s) to the best possible, balanced one(s) for internal use.**
- **High quality, gold plated RCA chassis connector or 2-pole screw connector on board.**
- **High quality MKP input capacitor on board, can be bypassed.**
- **Two exactly balanced (counter phased) output signals (as f.e. required in many ADC's, DSP's, etc.).**
- **Provides the correct signals required for transforming / operating a stereo amplifier in bridged mode.**
- **The circuit has an input transformer-like behaviour, yet with a way higher frequency range.**
- **Variable gain up to 6dB and input impedance by fixed resistor L-pad divider or 20-turn trimmer.**
- **Low and high supply voltage connections.**



The patented **OutSmart ™** technology shows a transformer like behaviour and, since both signals follow similar and the same amount of electronics, provides two perfectly counter phase signals. With the THAT 1646x chip as we use here, you obtain an extremely good balanced signal for internal use with an amazing voltage swing capability up to 16Vrms into 600 ohms!
About the complete electronics, except for the power supply parts are on the chip already, even the (0,1% laser trimmed) resistors which would be mounted externally in a regular opamp circuit. Due to the extreme high quality of the chip with a transformer like behaviour and laser trimmed resistors, it's very expensive compared to regular, even high quality opamps.
It lacks the typical "opamp sound" as hated by many though ! *scale 1:1*

Principle

Let's explain this OutSmart technology a bit.
Many other electronics use regular opamps.
Yet, regular opamps can't cope with serious disturbing signals coming from longer signal lines, the gain setting resistors are mounted externally, also causing errors due to tolerances, differences in path lengths, etc.
And then, there are again two "regular" opamps with a typical sound signature in your signal path.
In the continuing price war, about everybody uses NE5534, and so all have a similar, slightly aggressive sound.



On this module we use a THAT1646 IC, known as one of the very best available balancing circuits today.
The full, way more complex design is in the single 8-pin IC already.
It is used in the most expensive studio equipment, etc. Learn more about it from the datasheet. Interesting !
We only like to comment here that both signals follow exactly complimentary electronics and the (0,1%) laser trimmed gain setting resistors are on chip already.

The patented **OutSmart ™** technology shows a superior, transformer like behaviour. Actually, we believe it's even better, since it sounds completely transparent and impulse/frequency response are way better.
So, since about all is in the IC already, we could make the PCB most simple actually. About all the electronic parts around the IC are just Power Supply parts and RC input filter. In this v2 design even an input cap fits.

Mounting

This module is mounted by the high quality, gold plated (RJ140G) Line input connector only, with a drill hole of Ø12mm. Since this PCB hardly has any weight, mounting the connector in the cabinet chassis is sufficient. In fact, mostly you just need to exchange an existing RCA chassis connector by this module.

With this v2 version you also could decide for a 2-pole input screw terminal instead for internal use.

The two counter phase signals are present at the 6-pole screw terminal.

The now available balanced signal can be used inside any electronic equipment, like a preamplifier or ADC.
However, we guess it's mostly used in bridged mode amplifiers, explained in the appendix below.

Power Supply

There are power supply connections (+12V and -12V) for use in low voltage applications below +/-13V.
Do not use higher voltages here, since these lines are paralleled by 15V Zener diodes which will draw severe currents otherwise!

In a Power Amplifier there is mostly no low supply voltage available, so we arranged some extra's.
Since this module will be used in bridged amps 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 amps power supply rails.
15mA Constant Current Diodes (CCD) provide a constant current over this wide voltage range. Then 15V Zener diodes regulate the internal supply to ±15Vdc. 6mA flows into the IC, the other 9mA via the zeners.

Some figures

Gain:	0, +3 or +6dB
Input impedance:	0dB: 9,4k, +3dB: 6,0k, +6dB: 5,0kohms
Output impedance:	25 ohms
Max voltage swing:	V power supply -2.2V (27,5dBu max)
Frequency range:	> 1MHz.
Slew rate:	> 15V/uS (way faster than most opamps)
Gain:	up to +6dB, set by a fixed resistor divider or a 20-turn trimmer.
Distortion:	< 0,005% THD
Noise figure:	< 104dBu
CMRR:	> 65dB @60Hz under all circumstances
Power Supply voltage:	+/- 4 - 13V @ -12V / +12V connections, 7mA
	+/- 18 - 75V @ V- and V+ connections, 15mA
Dimensions	55x34x27mm (LxWxH) without input capacitor.

You can buy this device at our webshop and via our dealers. Dealer inquiries are most welcome.

DIY

We like to invite you to visit our webshop where over 15.000 products can be found, all for high quality audio DIY. You'll find our own wide range of modules, drive units, crossover parts, connectors, cabinets, etc. etc.

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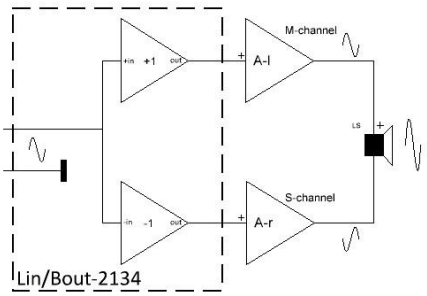
Bridged mode amplifiers appendix

A specific way of rewiring a stereo amplifier in a specific way where about quadruple power is available is called bridge mode. In this case, the L side amp receives an exact copy, yet buffered, of the Line input signal. By feeding an inverted (180º phase shift) input signal to the slave (R) 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. Of course, your Power Supply and Power Transistors have to be able to process this extra power. In bridged mode a single speaker system needs to be connected between both + speaker connections, where around 3,5x (theoretically 4x) the normal power is available. The speaker – connections are NOT used then. Since the current about doubles, make sure that your PS and Power Transistors can handle this extra power !! Mostly you cannot load a bridged amplifier with 4 ohms or even less due to the already doubled current.

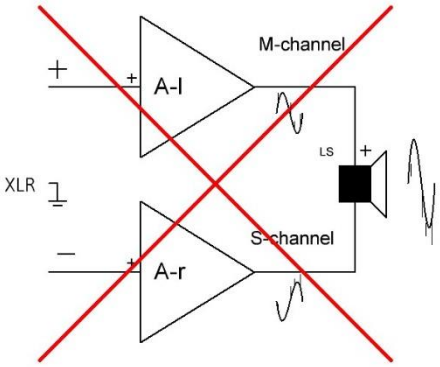
One could say that these counter phase signals are already available in a balanced (f.e. XLR) signal, so why the need for this circuit? This is amazingly often used in even expensive equipment. Doing so, you have a bridged amp indeed, but the advantage of a balanced signal, being free from external disturbing signals, is totally messed up and both amps need to process these disturbing signals, see the scope pictures in this drawing at the bottom of this page. CMRR will be very bad as well. Also, DC levels as often present, could be passed multiplied to the speaker outputs if it's a DC amp like ours. And then, do you have a balanced signal available?

In the many cases where a balanced signal is misused this way, you could decide to mount one of our BinBout modules, where the balanced line advantages stay intact AND the input signal is buffered as well. With those you can use the amps power lines to feed them.

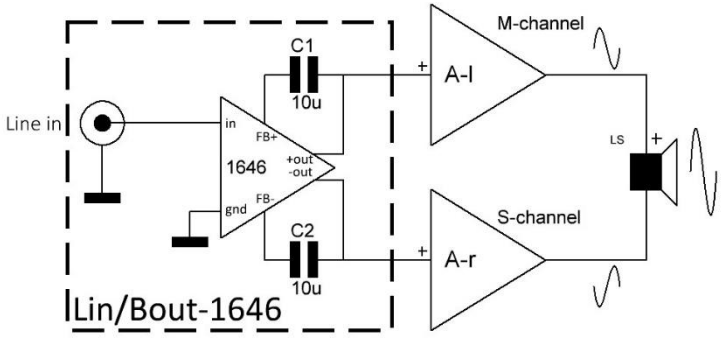


ELTIM Lin/Bout-3124 in bridge mode circuits

In many phase inverting circuits there are some degrees (frequency dependant) difference due to the fact that both signals follow electronics used in different ways. We have more cost effective modules working by this principle as well, f.e. our LinBout-2134 using the highly regarded LM2134 with dual opamps in one IC. While using the ELTIM LinBout-1646 all the mishaps possible do not occur and it acts as a very high quality input transformer. Actually even better since, unlike transformers, the IC's frequency range goes way over the audible range and the phase shift stays constant over the audible frequency range (and beyond) as well.
Now wiring of a TRUE bridged mode amplifier with a line input is done correct and most easy:



Common "Bridged" mode amplifier



ELTIM Lin/Bout-1646 wiring diagram

The left picture shows most commonly used for bridging an amplifier, but this is not only about quadrupling power, but also passing the sparks, RF-interference, etc. a balanced input SHOULD stop…. CMRR is very poor.

The right picture shows how to obtain an high quality bridged amplifier with a line input using our LinBout1646. The shown 10uF caps are for functioning of the IC itself (preventing DC offset) and are NOT in the signal path ! Yet, it are quality MURATA ceramic SMD's, mounted at the back side, directly connected to the IC pins.

Our Bin/Bout 128x module has a balanced input, yet with "regular" high quality opamps. Available with 0dB, -3dB and -6dB gain.

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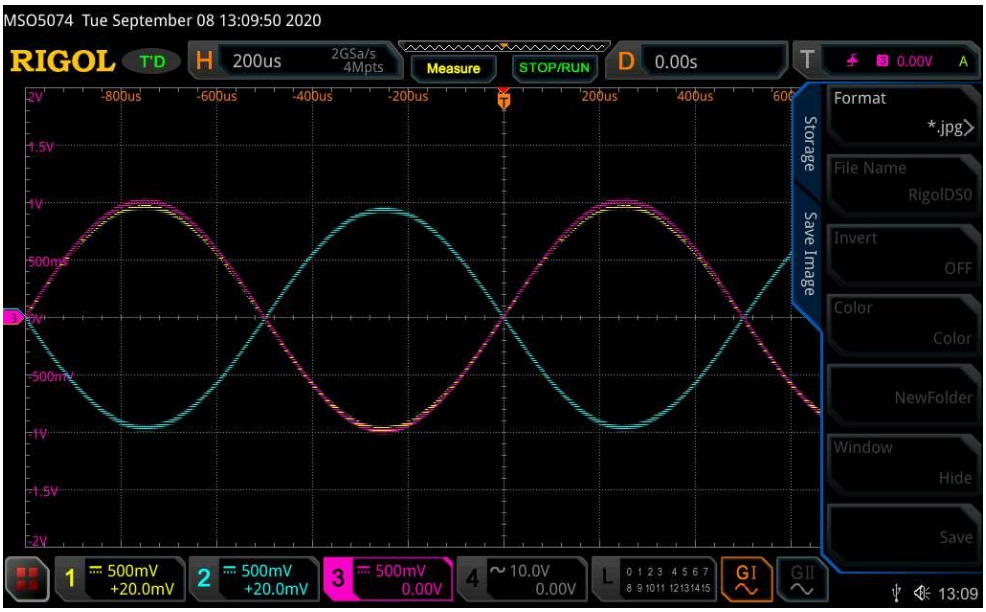
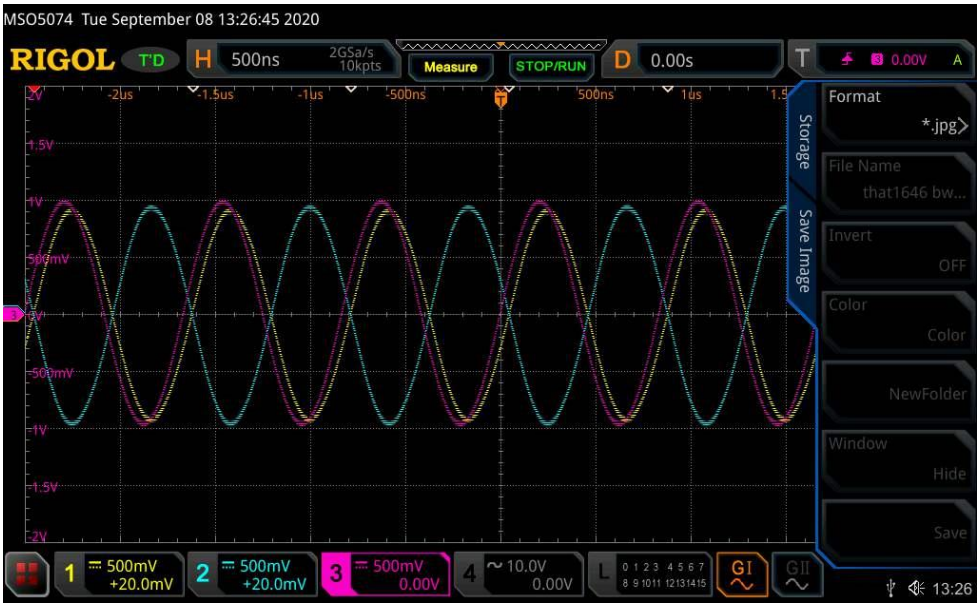


LinBout-1646 running at 1kHz/1V, 0º phase shift from input to + output.
Yellow is +out (0º), Blue is –out (180º), Magenta is input signal.



The same setup, now running under **1,2MHz** /1V.
We only now see a phase shift compared to the input and a slight gain loss.
Outputs crossing at the centre line and no distortion shown.
Visible distortion shows above 1,5 MHz in a simple test situation.

NOTE: measurements done without input capacitor and Pgnd and Sgnd connected.

We have never seen a Line > Balanced circuit capable of this.