Burson Audio Modules

By Ed Simon

For this review I received two clear light anodized aluminum (6000 alloy family, 6061 or 6105, I think) extruded tubing cutoffs 1.5″ in diameter by 6.30″ long with both ends plugged by a closed cell foam disc and covered in shrink wrap. Both were labeled "Burson Audio Melbourne, Burson sounds good like solid state should." One also claimed "Burson Audio Opamps, Dual, matched pair," while the other differed by claiming to be a "Single, matched pair."

FEATURES

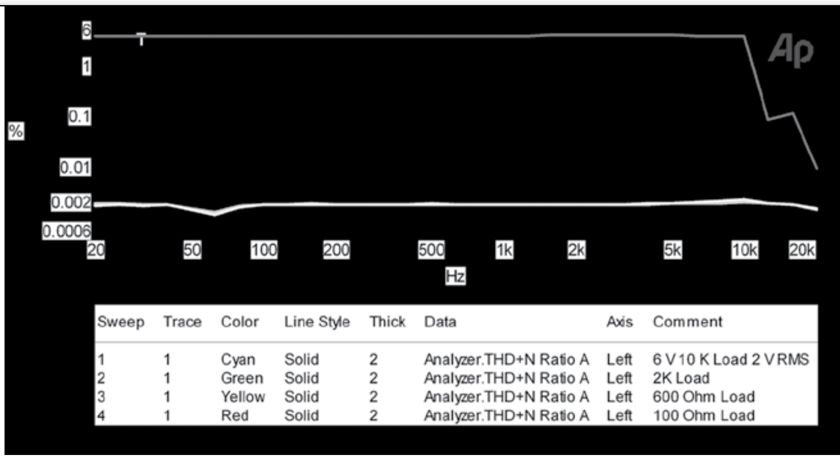
There also was a piece of hollow flexible tubing, spaghetti as it used to be called. For some reason, I expected Teflon, but this seemed to be silicone over fiberglass.

Opening the "Dual, matched pair" tube first, I was surprised to find no moisture-absorbing package—just two modules composed of two almost mirrored PC cards. Each card had 16 TO92 cased semiconductors, 15 fixed resistors, a single silver mica capacitor, and a Bourns multiturn cermet trimpot. All parts were of "audio" types.

Some of the transistor markings could be read—2SA970, 2SC2240, 2SJ74, and 2SK170. The same gain code (blue) was marked on all devices. Three jumpers connected the two cards. Four 20 gauge clad copper leads from each card came out to match an 8-pin DIP mounting.

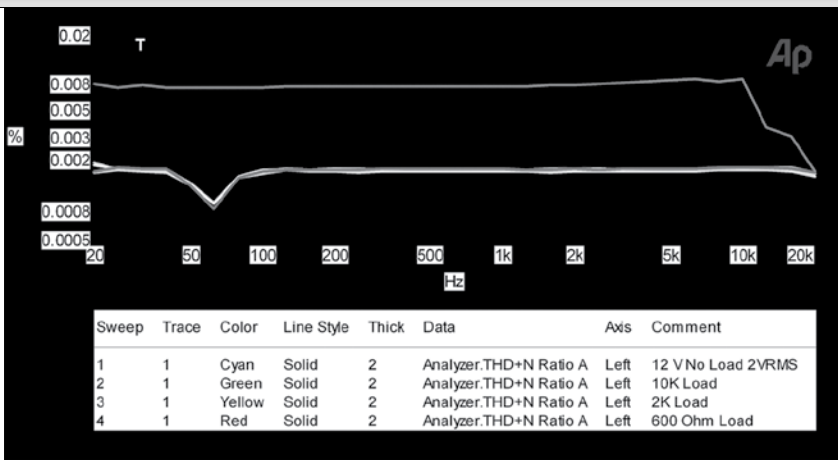
There are some people who believe that FETs (2SJ and 2SK) are the superior audio semiconductor for many reasons, including less RFI susceptibility. Overall, the build quality was good except for the three inter-card jumpers. They had been trimmed so that the cutting action also trimmed the solder joint. According to IPC standards, you should cut the lead and not the fillet. When the fillet is damaged it should be reflowed.

The single-page directions packed in the tube contained only the briefest of mechanical and electrical specifications. The dimensions for the dual op amp were given as 48mm × 22mm × 24mm. The modules measured 39mm × 23mm × 29mm, excluding the 37mm long leads. "Weight" was listed as 28 grams including leads. The mass was really 18.77 grams.



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	2	Analyzer.THD+N Ratio A	Left	6 V 10 K Load 2 V RMS
2	1	Green	Solid	2	Analyzer.THD+N Ratio A	Left	2K Load
3	1	Yellow	Solid	2	Analyzer.THD+N Ratio A	Left	600 Ohm Load
4	1	Red	Solid	2	Analyzer.THD+N Ratio A	Left	100 Ohm Load

FIGURE 1: Burson module distortion versus load with ±6V supplies.



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	2	Analyzer.THD+N Ratio A	Left	12 V No Load 2VRMS
2	1	Green	Solid	2	Analyzer.THD+N Ratio A	Left	10K Load
3	1	Yellow	Solid	2	Analyzer.THD+N Ratio A	Left	2K Load
4	1	Red	Solid	2	Analyzer.THD+N Ratio A	Left	600 Ohm Load

FIGURE 2: Burson module distortion versus load with ±12V supplies.

CD UPGRADE

Rather than see whether the electrical specs were as inaccurate, I decided to try out one of the dual op amps. A CD player seemed to be called for because they are often modified and there is internal noise (RFI) to worry about. I had two Sony SCD-CE595 Super Audio CD players left over from another project. One still sat on a shelf, the other had gravitated to the office sound system, and, when compared to the other gear, it screamed for an upgrade. A quick Google search showed these had been modified by others. It seemed that IC400 on the bottom of the one PC card in the CD player was all I had to change. It was a surface-mount small outline package.

Four sheet metal screws and three machine screws later, I had the cover off the player. Five more screws, and the PC board was loose. On the bottom, as advertised, was IC400. The website had mentioned some folks had difficulty removing this chip and lifted pads. The box did not have the CD mark on it, but I still assumed it would have lead-free solder.

Using braid wick and a 1.5mm tip, I made the solder under the chip disappear. The chip did not come loose. I noticed several very small hardened glue blobs on the edge of the PC card. The IC had been cemented into place before soldering. Cutting all four leads on one side allowed me to pry up the chip with a small knife tip. Then using solder wick, I picked up the first four loose leads, then the other four with the chip all at once. I now had a nice clean set of pads.

To confirm that the chip was a dual op amp, I tried to Google the part number marked on the chip—no luck. I then checked for continuity between pin eight of my chip and the same pin on two other similar chips. All were connected. Then I tried pin 7, no continuity. A single op amp in a package gets the V+ on pin seven, a dual gets in on pin eight, and this unit could not be a quad op amp because there were only eight leads.

The next problem was that the Burson dual op amp would not fit under the PC card; it was too big. The matched singles looked better, but they still were too thick and had too many leads. The singles also had two PC cards, with the op amp on one and the other a lead holder and ground plane. So it was time to change the second PC card to a piece of 0.002″ brass foil covered by insulation, and change the PC board jumpers to leads.

Now I had a single inline version of the op amp. Wiring the two units side by side underneath the CD players' PC card almost worked. The CD's PC card fit back in, but I had to tilt it slightly. Worse, the 20 gauge wire leads tore off the small pads.

Fortunately, under where the IC400 had been were two vias from the other side that carried inputs. The other two inputs had vias just outside where the IC had been. The outputs had vias to the coupling capacitors. The V- supply had a large pad and, with a bit of poking, I found a via for the V+.

I took a piece of stranded wire, split the stranding, and used each individual conductor to fit into a via hold. I then connected these short jumpers to the Burson SIP modules. A small spacer added to the back made sure the modules would not short.

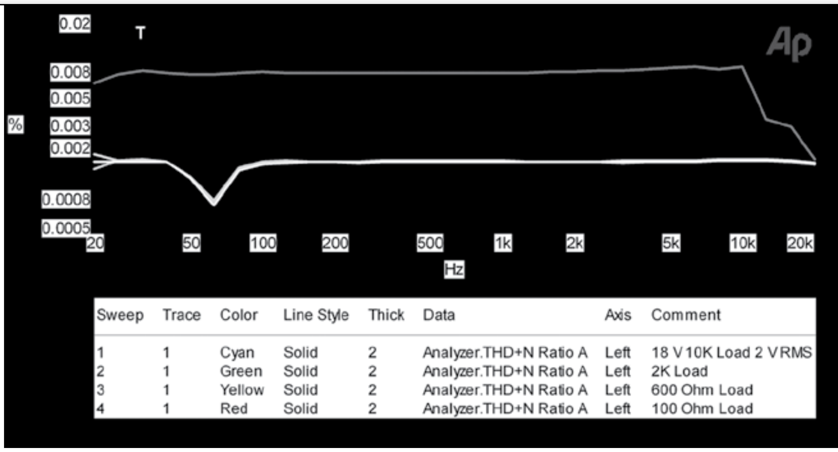


FIGURE 3: Burson module distortion versus load with ±18V supplies.

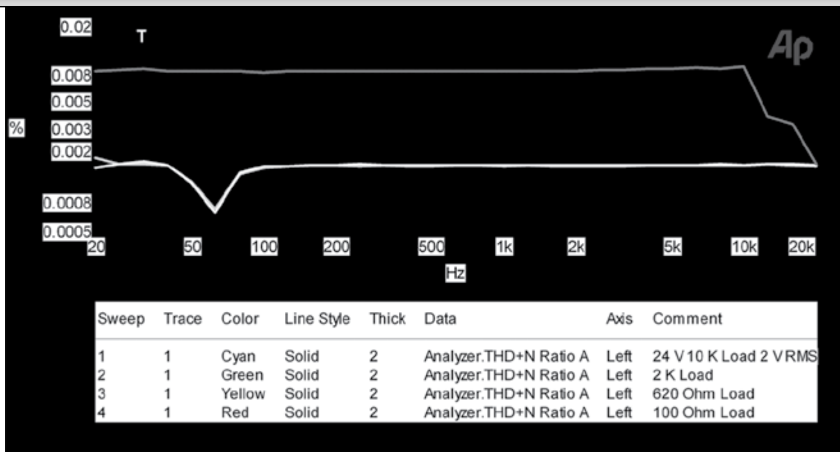


FIGURE 4: Burson module distortion versus load with ±24V supplies.

COMPARISON

The datasheet suggests doubling the value of the "nearby power decoupling capacitors" and replacing them with better units such as Elna or Blackgate. I wanted to know what the Burson did by itself, so I left them alone.

I then powered up the modified unit and the stock one. I burned matched CDs for each. The output of one channel of each went through a stepped attenuator (gold-plated Electroswitch rotary and Holco resistors) to my workbench amplifier (*aX* 4/2006) into an old Spica TC1 loudspeaker.

At first I just listened to be sure both worked. Then I left them running because the workbench amplifier actually needs to warm up a bit. Burson recommends a 100-hour burn-in for their modules!

I went back to the two CD players and took a quick listen and measurement. Another of the Burson meager specifications failed. The Sony CD player had the V- terminal connected to ground and the V+ was only 12V or so. This is half the voltage the Burson op amp is supposed to require.

So to do a fair comparison, I would now need to add a power supply to the CD player. Before I did that, I decided to do the deferred electrical tests to see at which supply voltages and loads the module worked best, because the datasheet gave a range which was already shown to be inaccurate.

MEASUREMENTS

The first thing I measured was the current consumption: 19mA per amp on each of the duals, not the 25mA specified. A spec that at least was close! So I measured THD at unity gain for loads of 10,000, 2000, 620, and 100Ω.

Notice that even at power supplies of ±6V the op amp is capable of working into loads as low as 600Ω at 2V signal, the maximum expected from a CD player. Turns out I did not need to change the power supply.

The distortion drops a bit at 12V and above. Even more interesting is the drop in distortion into the 100Ω load. This discrete op amp can drive loads as low as 600Ω easily and is usable even lower, but the distortion does rise.

Figures 5 and **6** present another difference from the instruction sheet. The distortion is really 0.0007%. Burson just claims less than 0.001%. Not only is the distortion low, but the higher-order products—the ones that sound bad—are almost immeasurable. This test is done at unity gain, which would cause the nasty harmonics to be larger. Using the op amp with a gain of 20 or so would be even better.

The Burson discrete op amps cost $90 for a dual, $180 for a matched pair of duals, and $115 for a matched pair of singles. If you think this is expensive, compare it to the better-known John Hardy 990 op amp. On the other hand, if you prefer to use an IC that can at best come close but not match the Burson, remember that most of them are not "purpose built" for audio.

One final short comment is that Burson expects you to use this discrete op amp as an upgrade to existing products. Of course, you can use this in new projects such as a power amplifier and eliminate more than half of the circuitry with something that is significantly better. This is truly a great DIY piece of gear. But then they probably want to sell you their version of amplifiers, preamps, and so on.

But if you are a really maniacal DIYer, you could buy a few hundred of each transistor type and match them, lay out a few different versions of the PC card to see how things interact, and even manage to select really good-sounding resistors instead, but it is your choice. You may find that to buy all the parts actually costs about the same as the complete module.

In conclusion Burson has produced a poor datasheet that does not live up to their product. A comparison of the stock amp to the Burson Pro version is smoother, sweeter, reaches higher without straining, and has depth that others only dream of.

So since I knew what the Burson discrete op amp is capable of doing on its own, I added a few more tweaks to the CD player, 1µF poly bypasses at the modules, and similar giant film caps instead of the miniature electrolytics, and Deoxit on all the connectors. It does not work miracles, but is a noticeable improvement.

The next step will be to build an amplifier using the Burson discrete op amp as a front end. I may even upgrade my preamp with a pair of modules. In pro use these should be a great microphone preamplifier.

Manufacturer's response:

We would like to thank the good people at *audioXpress* for this in-depth evaluation of our Burson Audio Opamp.

The incorrect dimension measurements relate to an older generation of Burson Opamp. Since your review, they have been corrected accordingly. Thank you for also pointing out that our new op amp is 33% lighter than its predecessor.

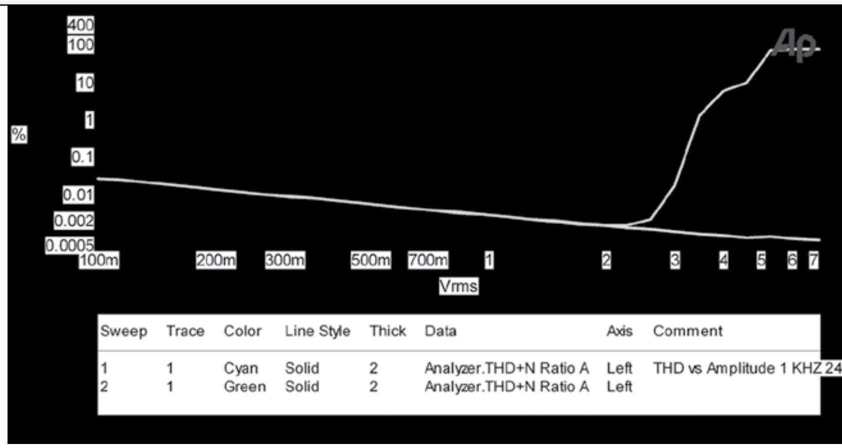


FIGURE 5: Burson module distortion versus amplitude 24V supplies.

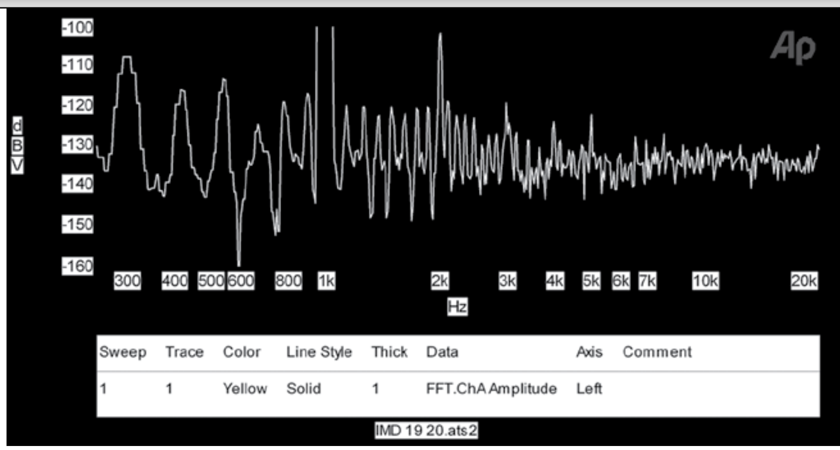


FIGURE 6: Burson op amp THD re 0dbV at 1kHz 12V supply.

The various working voltage and power consumption measurements listed on our instructions were recommended to ensure the most satisfactory outcome for our customers. They are not the minimal working requirements for the Burson opamp.

For five years we have worked tirelessly to alert fellow audio designers about the shortcomings of integrated circuitries (ICs) in any audio design, and to inform fellow audiophiles of the supremacy of the Burson opamp over any IC op amps. It is therefore most satisfying to finally receive formal recognition for our hard work by one of the most authoritative audio magazines in the English speaking world.

John Delmo
Burson Audio
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