

The Image of Transistors – A Persecution Beyond Belief?

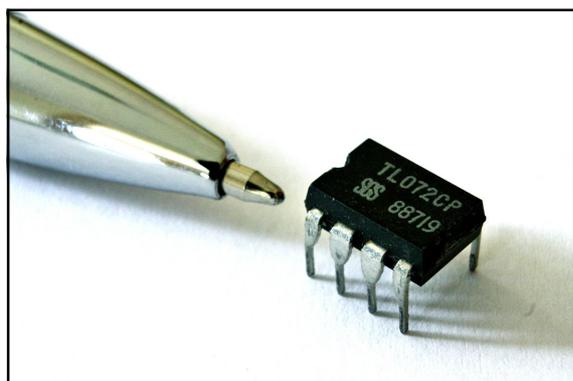
It's a truly unfortunate situation that the transistor, with regard to guitar amplifiers, finds itself in. The image that transistor guitar amplifiers have been given is grossly unfair! There... I dared to say it!

After decades of bashing by mostly unqualified 'valve nerds', who simply have no understanding of the breed, is it any wonder that guitar players have an entirely wrong view of transistors? Prejudice is a word I generally use with care, but is totally acceptable to put it to good use in this case. The resultant general image of transistors is about as idiotic as the notion of the world being flat! And whilst all this injustice is being committed, guitarists worldwide are missing out on a wonderful opportunity of experiencing amplifiers that are far more reliable, loud, lighter weight, can cost less to buy and run and at least as tone-full as valve amplifiers.

Speak with any guitarist, and you'll discover that his opinions of transistors has been set by the culture and misbeliefs perpetuated on guitar forums, by older players, music shop sales staff, magazine reviewers and just about anyone else who is connected to the industry of making music with electric guitars. He'll have no idea why he is saying what he is... only that he'd heard or read the myths and claims. "Well, everyone knows it's true!" is their response usually. As if to say, because it is commonly believed, it must be true!

You see, to be a cool guitarist you must have all the right gear and badges in your arsenal... having anything different means you won't fit in with the clan. So, I suppose a valve amp has been made to be pretty essential to that situation.

Well, let's think about it for a moment. No one qualified has ever stood up and defended transistors! That means there are only the negative images out there in 'electric guitar land!' No one has shown you any pictures of transistors or chips (Integrated Circuits)! No one has explained anything about them at all. All you, the guitar player has is what you've been told by other unqualified people. OK, so let's set that straight!



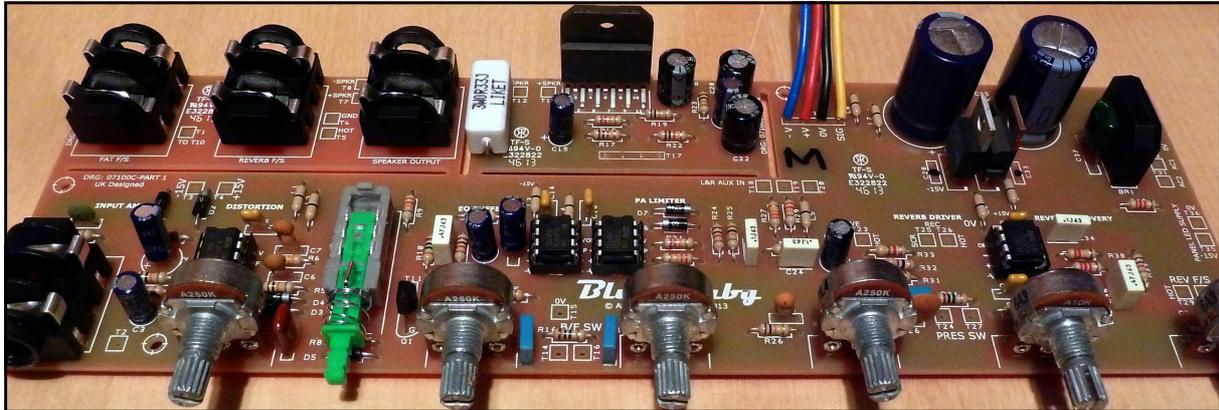
The picture on the left is an 'Integrated Circuit'... IC for short. It has eight connection pins and it can be soldered directly onto a PCB (printed circuit board) or plugged in via an IC socket. The latter is not so common, as ICs are very reliable and don't often have to be replaced, like valves do.

The type of IC that is used to amplify signals (guitar sounds) is known as an 'Operational Amplifier' (Op-Amp). There are many different ones, but the type most commonly used in guitar amplifiers is a TL072.

The TL072 has been around since the mid nineteen-seventies, so it's not anything new. It is quite low noise and is ideal for this application. Session amplifiers were probably the first company to use them in guitar amps.

Inside it has two amplifiers, just like an ECC83 valve does. In fact it does the same job, except it doesn't need to have 'heaters' to make it operate. So it runs in a virtually cold state and uses far less power.

When used in guitar amplifiers, the TL072 amplifiers are never allowed to distort, they just amplify the signal faithfully. So the idea that they add horrible distortion harmonics to the sound is not true at all... it's a myth! Any required distortion is created by other components outside the IC. So, the IC is NOT responsible for the tone of the amplifier per se. A TL072 is tonally transparent and you would be hard pushed to tell it apart from an ECC83, although some 'supernatural beings' with 'golden hearing' might tell you otherwise!



Above is a picture of a PCB from Session's latest BluesBaby™ guitar amplifier. You can see that there are four TL072 ICs mounted on it, via 8 pin IC sockets. Apart from the ICs, the other components are pretty much the same types as would be used in any valve amplifier.

At the top centre of the PCB, you can see another type of IC standing up which has eleven connection pins. This is the power amp IC. Internally, it is very similar to the TL072 ICs except it is also equipped with power transistors which are able to convert the small weak signals at its input in to strong heavy duty signals powerful enough to drive a guitar speaker. It works just like power valves do, except you will not need to change it ever. Its power transistors are 'biased' in class B, in the same way most power valves are... or it wouldn't work!

The power IC will reach close to 100°C when in use, so has to be bolted to a metal 'heatsink' to keep it cool, or it will fail. The amplifier's chassis is the heatsink in this case. Heatsinks are usually made from aluminium (aluminum) as it dissipates (soaks up) heat much quicker than steel does. The cool air around the heatsink draws the heat away (like a home radiator) much quicker too. That's why BluesBaby's chassis is made with aluminium, it is far superior to steel.

The power amplifier IC needs to have negative feedback, just like a valve amp often does. Without it, it simply won't work! However, there is one thing a valve amp has which influences its sound, that a transistor amplifier does not... an output transformer. It is this transformer which is mostly responsible for the way a valve amplifier sounds, because it drives the speaker with a technique called 'constant current'. This gives the tone a bright jangly sound (chime) with a warm 'fluffy' increase in bass around 80Hz - but is NOT accurate though.

BluesBaby™ has extra feedback in the power amp which enables it to copy exactly what an output transformer does to the tone, by introducing 'constant current' drive. This also has the effect of making the amplifier sound louder too by causing 'cone overshoot'... in the same way an amp with an output transformer does. Many of the older transistor amps around did not have this feature, which is why they are said to sound 'cold' and less loud. This is no longer true in the case of modern Session amplifiers.

At the top right of the PCB you can see the power supply's rectifier, filter caps and voltage regulators for the preamp section. Again, this is all common to a typical valve amplifier.

Whilst the photos show images that may seem a little alien in some respects, I hope this will help you see that there is really very little difference between valve and transistor amplifiers. **End.** ©Stewart Ward