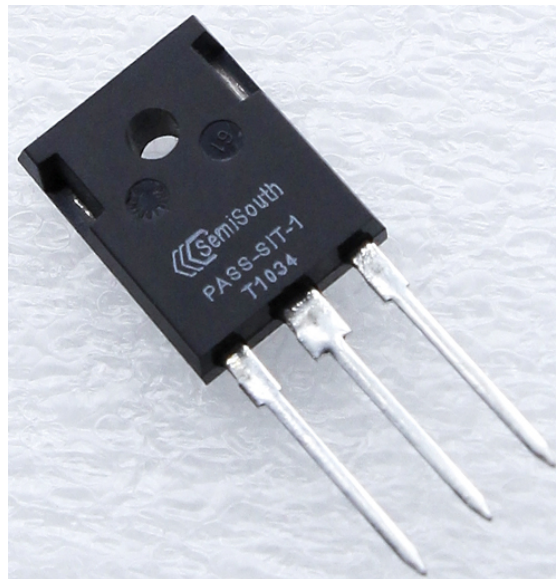


FIRST WATT SIT-3 STEREO POWER AMPLIFIER

(preliminary introduction)

The successor to the SIT-1 and SIT-2 amplifiers is now in production. Like them it uses a Static Induction Transistor (aka VFET) in the power stage of a simple no-feedback amplifier. This SIT was uniquely fabricated from Silicon Carbide with the character of a tube Triode – acting more like a voltage controlled resistor than a current source. The primary benefit of the SIT is the much-desired audio quality of a Triode tube, and is different from ordinary FETs which have a Pentode character.



Unfortunately, there was only one production run of this transistor, commissioned by First Watt and made by the now defunct SemiSouth, so there is only a limited quantity. Most of these SIT parts were used up in the first two amplifier models, but a relatively large portion were held for service needs that did not occur. A portion of these remaining parts have been allocated to the SIT-3.

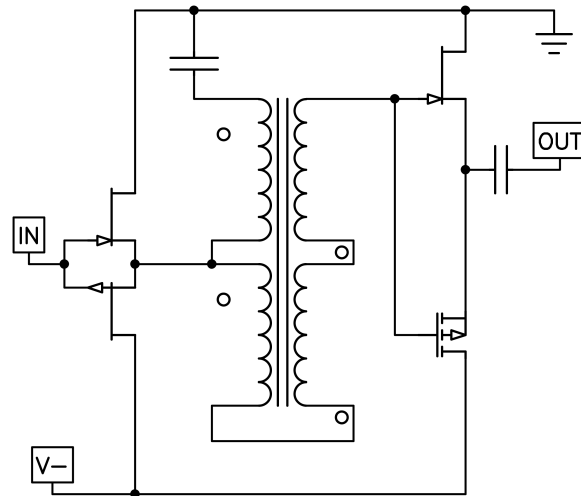
There is a major difference – the SIT-1 and 2 operated the transistor in *Common Source Mode*, which delivers both voltage and current gain. The SIT-3 operates in *Common Drain Mode*, which delivers only current gain – it is a voltage follower.

It is unique because it operates in a push-pull topology I call **DEF** - the **D**epletion type N channel SIT is mated with an **E**nhancement type P channel Mosfet to form a self-biasing Class A power **F**ollower. Apart from elegant simplicity, this has the square-law character of a Triode circuit but with more current available to the load.

Compared to the single-ended SIT-1 and 2, this push-pull Class A has twice the power into 8 ohms, eight times the power into 4 ohms, 10 times the damping factor,

and one-fifth the distortion while having that second harmonic character. This follower stage does not provide voltage gain, so the SIT-3 uses a high quality auto-former to boost the preamp voltage by 11 dB, buffered by push-pull Jfet followers to give an input impedance of 200 Kohms.

Here is the simplified schematic showing the topology of the SIT-3:

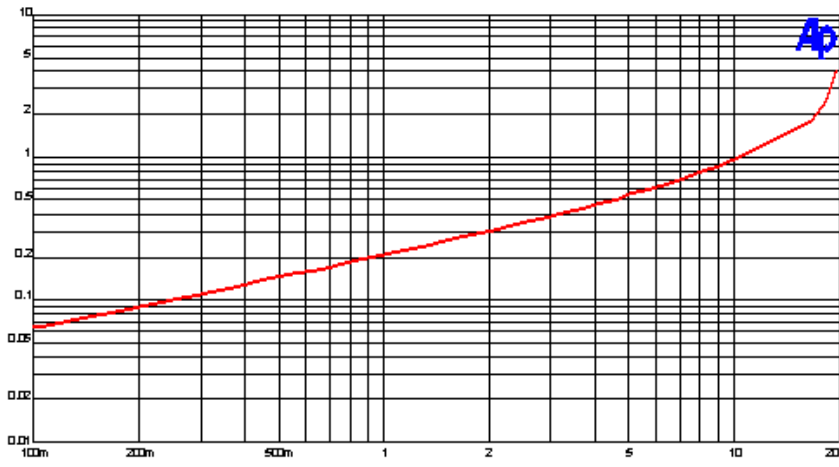


You can see the input Jfets followers driving the auto-former, which develops voltage gain for the power output followers. Besides the unusual DEF / SIT output stage, you might notice the inverted power supply, which dramatically reduces supply noise seen by the SIT. This design requires careful selection of the characteristics of each SIT matched to the Mosfet – their Gate voltages must be carefully matched, and fortunately this SIT device falls into the range where such matching is possible.

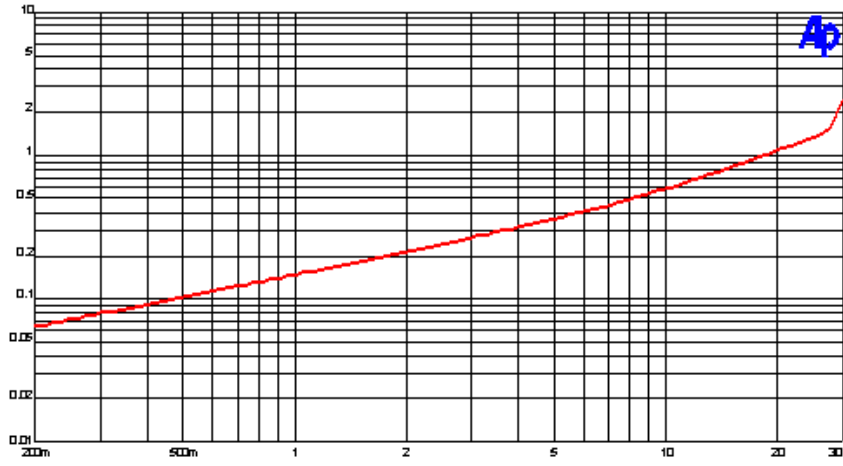
The actual circuit is hardly more complicated, and includes a few new tricks to get both the purest square-law performance with solid stability.

Here are some curves and specs of the SIT-3:

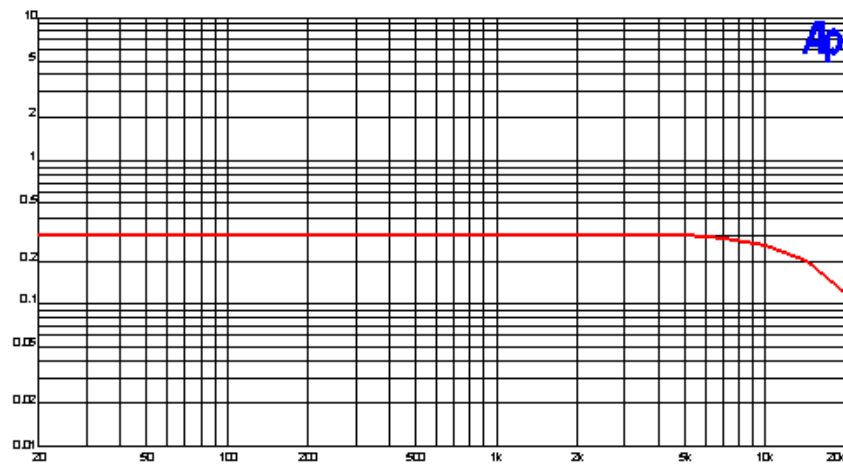
| | |
|--------------------|--------------------------------------|
| Maximum output | 18 watts @ 8 ohms, 30 watts @ 4 ohms |
| Input Impedance | 200 Kohms |
| Gain | 11.5 dB non-inverting phase |
| Damping Factor | 30 |
| Frequency Response | -0.5 dB @ 10 Hz, -3dB @ 50 KHz |
| Output Noise | 50 uV unweighted 20 - 20 KHz |



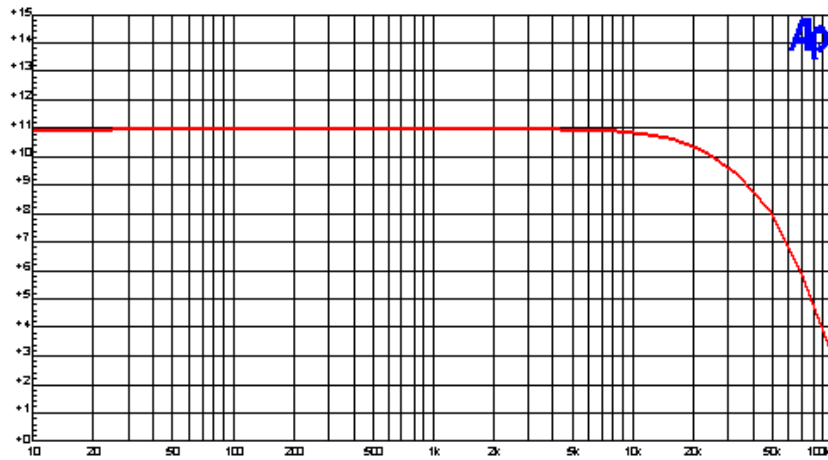
SIT-3 DISTORTION VS OUTPUT WATTS @ 8 OHMS



SIT-3 DISTORTION VS OUTPUT WATTS @ 4 OHMS

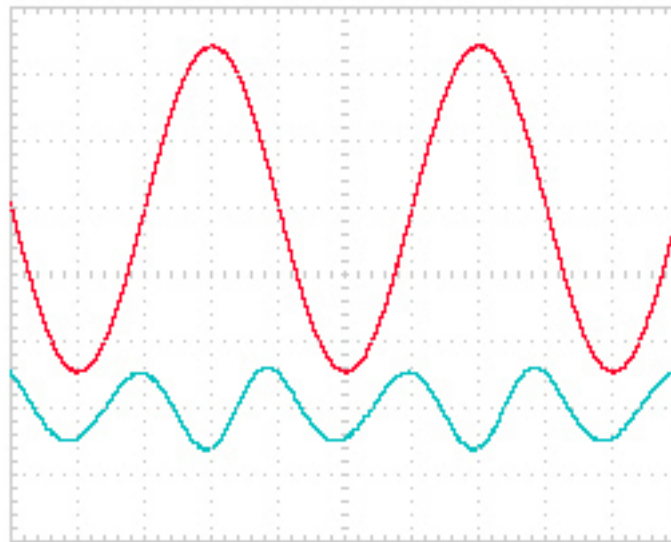


SIT-3 DISTORTION VS FREQ @ 2W



SIT-3 FREQUENCY RESPONSE

Here is an example of that 2nd harmonic character seen in the blue waveform:



DISTORTION @ 3 WATTS / 4 OHM

The SIT-3 represents a departure from the SIT-1 and SIT-2. The design has moved closer to the mainstream in amplifier offerings in almost every respect, including a lower price tag. Did I mention that it is a stereo amplifier?

This doesn't say very much about the sonic performance, which is subjective, but this design did beat several other contenders (all of them a lot easier to make) in extensive listening. The SIT-3 has an organic quality that breathes more depth and life into the music, but is a bit more subtle than its predecessors.

This is one of those all-night, year-after-year pieces.