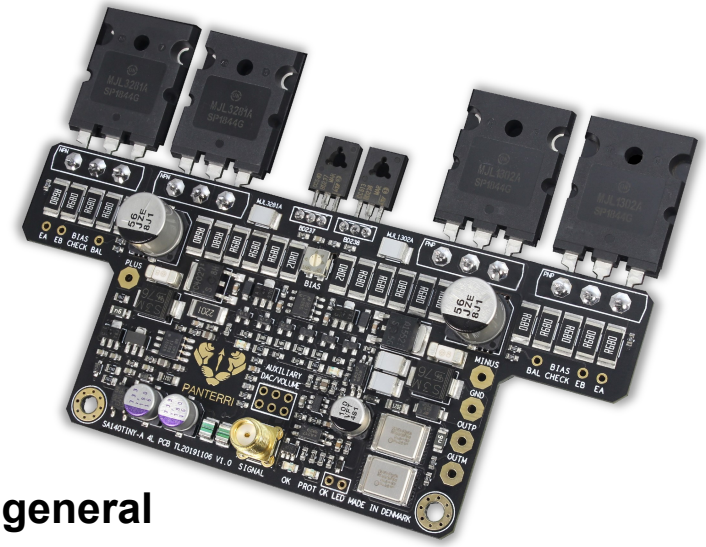
Data Sheet
January 2020

SA140TINY DIY MODULE

High-end Class A/B amplifier



Specifications

140 Watts RMS into 8Ω Class A/B
260 Watts RMS into 4Ω Class A/B
Power BW: 5Hz – 260KHz -3dB
Power BW: 5Hz – 45KHz -0.1dB
Slew Rate: > 72V/µS
Signal To Noise Ratio: >109 dB (flat).
Total Harmonic Distortion: <0.02% @ 20W, 8Ω
Damping Factor incl. SSR: 580 @ 100Hz 8Ω
Output Impedance incl. SSR: 13.7mΩ
Input sensitivity: 1.5V RMS.
Input Impedance: 22KΩ
Voltage Gain: 29dB / AV = 28.
Continuous Load Impedance: 4-16Ω
Min. Load Impedance: 1.5Ω
Power Voltage, Class A/B: +/-28 to +/-60VDC
Power Voltage, Class A: +/-28 to +/-34VDC
Board Size: 119 x 52.2 mm.
Board Weight: 69 grams

Features

Precision DC servo
DC Fail protection
Temperature protection
Over/under voltage protection
Shielded 4-layer gold plated PCB
Plug-Play construction
Class A or A/B operation
Fixed Cut current lim. for less peak distortion

Applications

High End amplifiers
Professional audio and music
Home theater systems

In general

SA140TINY is an advanced and powerful small form factor HI-FI amplifier, actually an extended version of our smallest amplifier SA100TINY-A. This means that it is capable to run more low ohmic speakers. It provides at least 140 watts into 8 ohms or 260 watts into 4 ohms. It is built with the best components, e.g. we have used Panasonic Ultra low ESR and OS-CON Electrolytes, film capacitors and a high performance DC servo which has resulted in a warm, delicious and very detailed sound.

The amplifier is built on a high-quality four layer gold-plated PCB which has made it possible to make a total separation of audio signals on the top and control signals on the bottom side. The separation is made with an unbroken ground plane, which at the same time serves as a very effective noise shield for the sensitive sound signals. The construction with SMD components provides the shortest possible paths between the components and therefore minimizes parasitic inductions in the construction.

It can both be used as a standard class A/B amplifier, but also as a pure class A amplifier, however, in class A mode, the output power will be limited to approx. 30 watts into 8 ohms.

The amplifier contains a DC servo that continuously keeps track of the zero point. In addition, there is also a completely noise-free microprocessor for controlling and monitoring temperature, DC fault circuit, output current and power supply voltage. There is also a built-in solid state safety relay for protecting the speaker during start up or if an output failure occurs. Therefore, the only extra thing needed to build a complete power amplifier is a power supply, an enclosure and a suitable heat sink. We recommend the PS140TINY as power supply for this amplifier.

Panterri Audio Denmark
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Structure

The amplifier is symmetrically constructed and has a dual differential input amplifier and a push pull voltage amplifier. The output stage is constructed as a push pull emitter follower. The input and voltage amplifier runs class A operation, so it is possible to choose whether to run class-A/B or pure class-A simply by raising the idle current in the output stage. This can easily be done on the small trim potentiometer at the top of the PCB. However, you has to choose in advance which type you want, since the power supply must be adapted.

The symmetrical structure ensures that there is always the lowest distortion and the best possible DC balance in the output stage, which in addition is continuously corrected by a very precise DC servo.

Add-on Module

The amplifier is prepared for mounting future add-on modules of different kinds that can be placed on top of the PCB. E.g. there will be a DAC with integrated volume control so the amplifier can be fed directly with a S/P-DIF signal instead of an analog signal. This feature increases the signal to noise floor and is intended for use with our future active DSP crossover. Then it is possible to build a very low noise active speaker system with one unit for each speaker. All signal routing will be digital directly to the amplifiers. These add-on modules are not ready yet, but will be available in our online store in the near future.

DC-servo

The amplifier includes a precision DC servo that keeps track of the DC level at the output. The servo is slowly regulating, so actually it takes up to one minute to regulate the amplifier completely in place to the midpoint, 0 volts. The reason why the servo is made so slow is to prevent it from affecting the sound quality. In many amplifiers, with DC servo, it often regulates fairly quickly, typically within 50-100 milliseconds, which can affect the impulse response at low frequencies. Our servo regulates so slowly that it in no way affects the sound quality.

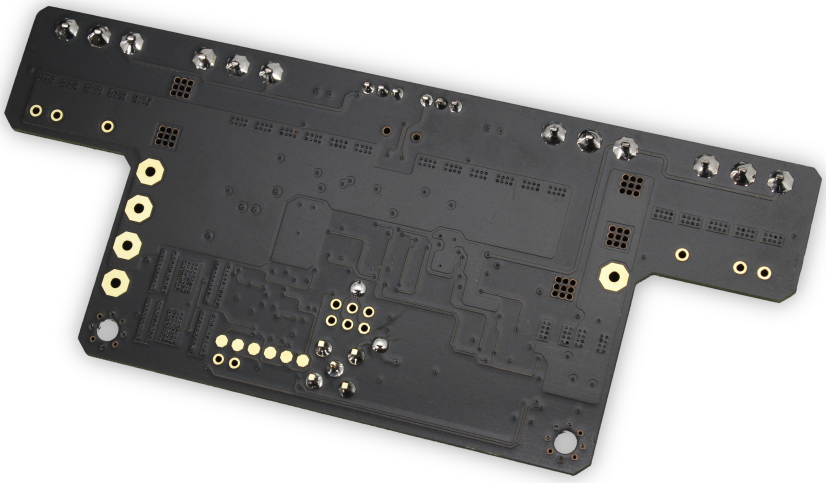
Solid State Output Relay

The amplifier has an onboard low distortion solid state relay (SSR) to protect the connected speaker. This relay has two functions. The first and most important thing is to disconnect the speaker if the output stage fails so the speaker is not damaged. The second function is to delay the connection so that "pop" sounds are avoided during start-up and shutdown of the amplifier. Such a relay between speaker and amplifier is a must. If an amplifier fails in the output stage and there is no relay for immediate cut off the speaker, it may, in worst case, cause damage to it.

Our solid state relay is better than most mechanical relays. We have used top of the line MOSFET transistors (DirectFETs) to built-up the relay, which gives low distortion, less loss and very high reliability. Therefore the sound will always be perfect – even after many years of use versus a standard mechanical relay. There are no mechanical contacts that can be corroded over time. However, it is possible to bypass the built-in relay if it is desired to use a different type.

Over Current Limiter

We have built the amplifier so that it makes a clean cut if it is overloaded instead of the traditional current limiter which most power amplifiers have. If the output current becomes higher than the maximum allowed value, the amplifier will turn off the output quickly and the red onboard status LED will flash. We have made the fuse in this way to avoid unnecessary distortion that inevitably arises in amplifiers with ordinary current limiters when the music peaks at heavy loads. The amplifier turns off at peak currents above approx. 40 Amps.



Over Heating

If the amplifier is driven hard for a long time and it cannot get rid of the heat, it will shut down when it reaches approx. 100°C and then start up again when the temperature has dropped. The red LED will flash three times, followed by a short break in a loop until the temperature has dropped to 80°C.

Start-up delay and DC error detection

When the amplifier is starting up, the red LED will flash continuously until the DC level is stabilized. If the amplifier is exposed to DC at the input or if an error occurs at the output, the error circuit will turn off the output and the red LED will flash constantly. If the amplifier does not start at all but flashes constantly, the output is faulty and the amplifier must be serviced.

Too high voltage

If the amplifier is connected to a supply voltage above +/- 64 volts, it will shut down and the red LED will flash twice followed by a short break in a loop until the voltage has dropped.

Too low voltage

If the amplifier is connected to a supply voltage below +/- 24 volts, it will shut down and the red LED will flash constantly until the voltage is increased. This feature also disables the speaker before the amplifier becomes unstable.

SA140DIY

Two of these modules are used in our demonstration amplifier, SA140DIY.

Class-A operation

If you wish to build the amplifier as a Class-A, you have to use a power supply with less voltage and higher current capability. In addition, you need larger heat sinks, as the amplifier must provide its maximum power continuously. Therefore it will be very hot and the output power is limited to approx. 30 watts into 8 ohms.

A class-A amplifier allways provides maximum power continuously as opposed to a class-A/B amplifier that delivers a much lower average power depending on the volume and music type (the crest factor). Therefore, when the amplifier is to provide maximum power continuously, it is necessary to reduce the output power, or else it will over heat. This is done by lowering the supply voltage. Therefore, a class-A amplifier typically cannot play as loud as a class A/B amplifier of the same size, in turn, it has less distortion.

To get the amplifier in class-A operation it must be set at a higher idle current (bias). The way you do it is described in more detail in the extended user manual.

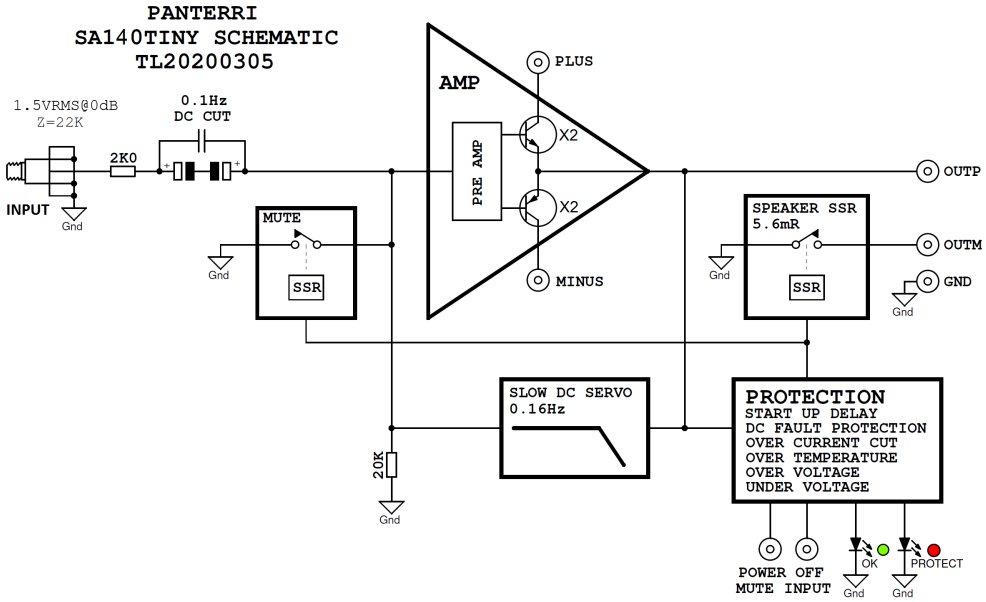
Class-A/B operation

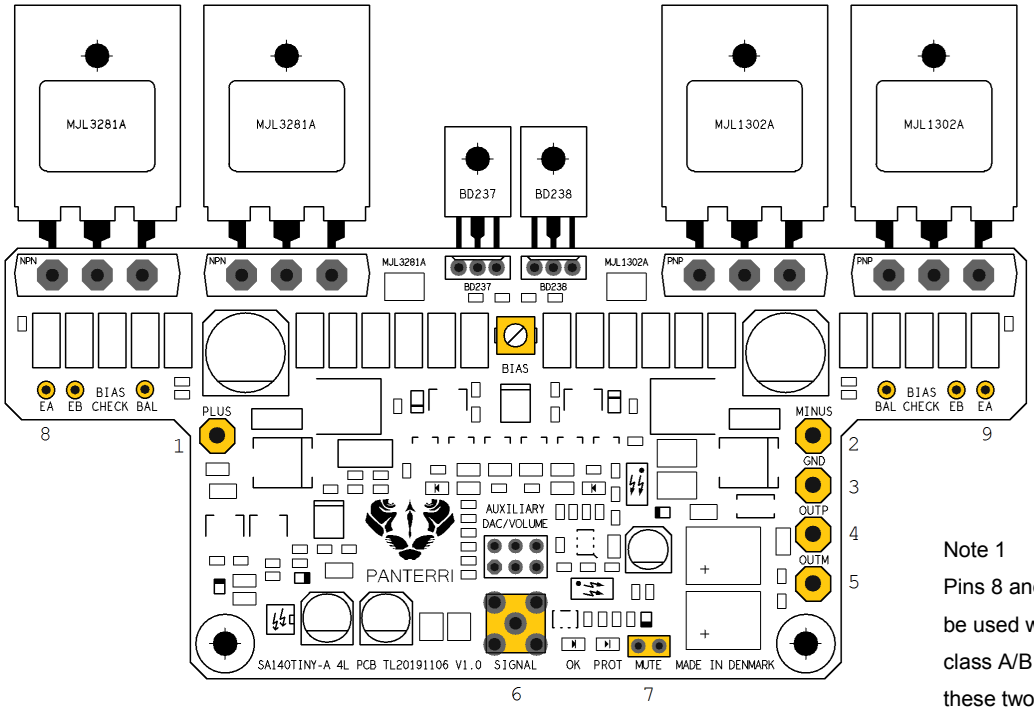
The amplifier is adjusted to class A/B operation from the factory so in most cases it is not necessary to adjust further.

Bridge

The amplifier is not suitable for bridging.

Connections & schematics





Pin no.	Function	Notes	Direction	Typical Wire
1)	Power supply PLUS	+28 to +60 VDC	Input	Red 2.5mm2
2)	Power supply MINUS	-28 to - 60 VDC	Input	Blue 2.5mm2
3)	Power supply GND	Gnd	Neutral	Black 2.5mm2
4)	Speaker out PLUS	0 to max 40 VAC	Output	Yellow 2.5mm2
5)	Speaker out MINUS	Switched GND	High-Z/Gnd	Green 2.5mm2
6)	Signal input	SMA connector	Input	Black RG174 SMA
7)	MUTE switch	Mute when shorted	Input	2 x 0.14mm2
8)	Positive BIAS test point	See note 1.	Output	Measure probe
9)	Negative BIAS test point	See note 1.	Output	Measure probe

Note 1

Pins 8 and 9 are test points that should only be used when adjusting bias. For normal class A/B operation, adjust to 20mV between these two points. If the amplifier is to run in Class A mode, these must be adjusted to 370mV. Note that the supply voltage to the amplifier must not exceed +/- 30V for Class A operation. When adjusting bias, the amplifier must be warm before adjusting and there must be no signal on the input while adjusting. Sometimes it may be necessary to re-adjust the amplifier when the temperature has stabilized. The trim potentiometer, marked BIAS, should be used for this operation.