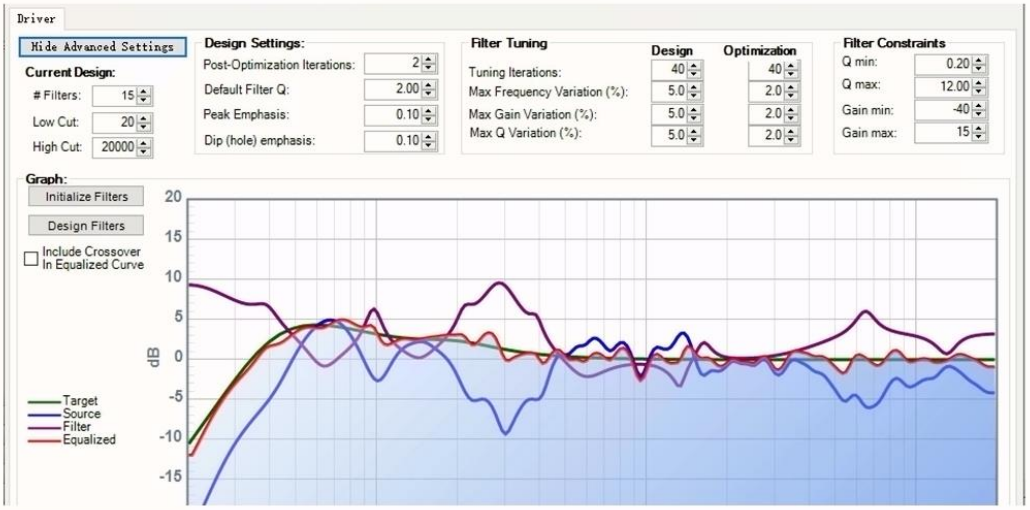
World's First
TPA32xx Based DSP Integrated
Portable Desktop HiFi Amplifier



SY-DAPx002 series DIYable desktop amplifier are high quality, high fidelity class D audio amplifier base on Texas Instruments PurePath™ Ultra-HD TPA32xx series chip-set, integrated high efficiency low noise Quasi-Resonant power supply, Sigma DSP and Bluetooth 5.0 wireless audio streaming.

with highly customized design by our technology, this bran-new desktop amplifier has many new features and committable performance on its unique design.

Tips

- Install this unit in a well ventilated, cool, dry, clean place-away from direct sunlight, heat sources, vibration, dust, moisture, or cold.
- On the top of this unit, do NOT place:

  - Other components, as they may cause damage or discoloration on the surface of this unit.

  - Combustible (i.e. candles), as they may cause fire, damage to this unit, or personal injury.

  - Containers with liquid in them, as they may fall and the liquid may cause electrical shock to the user or damage to this unit.
- Do not cover this unit with a newspaper, tablecloth, curtain, etc. in order not to obstruct heat radiation. If the temperature inside this unit rises, it may cause fire, damage to this unit, or personal injury.
- Use the voltage specified on this unit Only. Using this unit with a higher voltage than specified is dangerous and may cause fire, damage to this unit, or personal injury. 3e audio will not be held responsible for any damage resulting from the use of this unit with a voltage other than that specified.
- Do not attempt to modify or fix this unit by yourself. Contact qualified 3e audio service personnel when any service is needed. The cabinet should never be opened for any reason.
- When not planning to use this unit for long periods of time (i.e. when going on vacation), disconnect the power cable from the AC wall outlet.
- For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet. This will prevent damage to the product due to lightning and power-line surges.
- For any DIY modification please be sure you follow our guide line and be sure not modify any other sections that don’t list here, be aware that any incorrect modification has RISK result in damage unit, changes or lose in function, the switching mode power supply section is not allow to any modification!!!

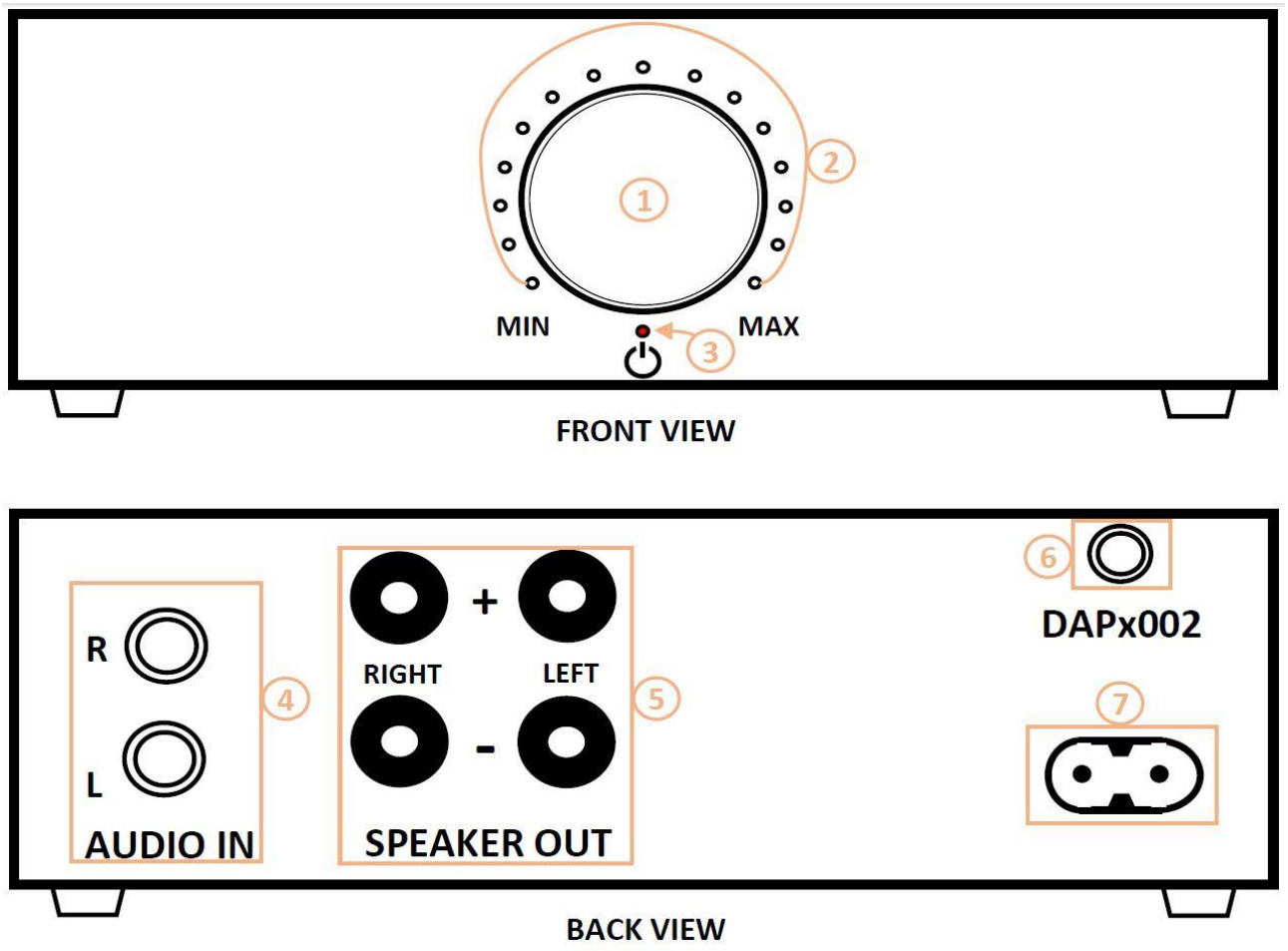
Key Features

- Texas Instruments TPA32xx PurePath™ Ultra-HD Analog-Input high performance Class-D power amplifier that enables true premium sound quality.
- Efficiency up to 90%, further reduce power dissipation and thermal.
- 28-/56-bit, 50 MIPS digital audio processor(ADAU1701) with build-in ADCs and DACs for full integrated audio path processing and control.
- Powerful Signal processing includes equalization, crossover, bass enhancement, multiband dynamics processing, delay, compensation, speaker compensation, and stereo image widening.
- Full digital volume control for best precise linear control and lowest distortion.
- Built-in multi-Function KEY for all UI control like volume and BT connection and playing
- Built-in 15 Segment LEDs Ring for volume indicating and other UI etc.
- Qualcomm Bluetooth 5.0 (QCC3008) with aptX, better sound quality, longer transmission distance.
- A large number of audio grade components are used to achieve best sound experience.
- State of art, fully differential audio path layout design for lowest noise cancellation and distortion to get the highest performance on all sections.
- Full feature protection circuit build-in like over temp, overcurrent, Pop noise suppression etc.
- High quality integrated power supply designed for highest audio experience.

Specifications

Audio Inputs	RCA, Bluetooth (5.0 aptX) **RCA is default input, auto switch to Bluetooth input when audio is active*
Speaker Impedance	4ohm(Minimum) ~ 8ohm(recommended) **Maximum Peak Power depend on power supply capability in varied system*
Input Sensitivity	RCA: 1Vrms(adjustable) Bluetooth: 0dBFS
Output Power	SY-DAP1002: 50Wx2(8Ω) SY-DAP2002: 100Wx2(8Ω)
Power Consumption	SY-DAP1002: 20W (Normal Volume) SY-DAP2002: 40W (Normal Volume)
Auto Standby Feature	Auto Entry Standby Mode When No Audio or Act unit after 20 Minutes, User Can disable by Update DSP F/W **SY-DAP1002 Rev1.0 version set to 10 Minutes*
AC Input	SY-DAP1002: Universal AC 100V~240V;50Hz~60Hz SY-DAP2002: AC 100V or 240V;50Hz~60Hz
Size	SY-DAP1002: 170mm*138mm*43mm(L*W*H) SY-DAP2002: 193mm*138mm*43mm(L*W*H)
Net Weight	SY-DAP1002: 0.9Kg SY-DAP2002: 1.2Kg
Case and Color	Aluminum Chassis, Matte Black

User Interface and Instructions



① Multi-function Key ② Volume LED Ring ③ Power LED ④ RCA Analog Input
⑤ Speaker Connector ⑥ Bluetooth Antenna ⑦ AC Input

- **Multi-function Key:**

  All UI control are implement by single Key combined potentiometer for volume.

  ➢ **Power On and Off**

  1. Short press will turn unit ON from standby mode
  2. Press and hold 2S will turn unit OFF from working mode

  ➢ **Volume control**

  1. Volume + : Clockwise
  2. Volume - : Anticlockwise

- **Bluetooth pairing:**

1. Continues fast press 2 times and hold 2S at second press till middle LED flickering indicate entry Bluetooth pairing mode, searches via phone and selects “SY-DAP1002 or SY-DAP2002”
2. Continues fast press 2 times and hold 5S at second press till all LED flickering to clear pairing list in case you used many device and fail on connection
3. Play&Stop : Short press
4. Next song： Fast short press 2 times
5. Previous song : Fast short press 3 times

- **RCA Input:**

  A standard stereo RCA cable can be used for any analog audio signal input, source device from DAC, media Player with high performance and low noise will better for getting good audio quality.

- **Speaker Output:**

  Any typically banana female connector can be used to easy connect to your passive speaker system, please pay attention to the polarity should be matched, it must follow the mark on the unit, to avoid any effect to the sound quality.

- **Bluetooth Antenna:**

  An external antenna is provided and you should use it for best BT performance.

- **AC Input:**

  Please use your local country C7 power core for AC supply, and note that we don’t provide this cable.

DIY Instructions

For some DIY consideration to have more fun and more enjoyable to our product, and meeting some special user case integration, we highly putting most of the diyable into our design and offering as many as possible to user to satisfy their potential changing chance.

Please note that all DIY change has potential RISK to damage the product and you will own the responsibility for all modification, and be sure that you or the modifier have good experience to make a good and successful change.

- **DSP EQ Tuning:**

  Beside a traditional DIY experience that by changing most of the analog audio path like input output buffer, OP-AMP type, etc. There is another way that can also make things magicable and powerful according DSP processing, we call EQ tuning, in this product we implement this base on Analog Device's SigmaStudio software.

  Below(figure1) demo example showing that a **User EQ** block had been reserved for DIY, all tuning and further modification **MUST** inside this block and others is locked to protect unnecessary function lose.

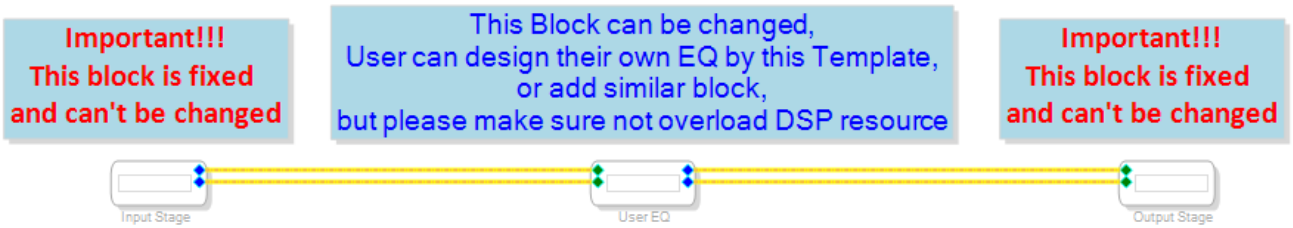


Figure 1: DSP Main Block

By default, there are 3 options inside User EQ block as figure 2, default setting is bypass without no any EQ on this product, user can select Param EQ or Auto EQ for their tuning, Auto EQ design is more complex and require more experience.

Reference material:

1. *https://wiki.analog.com/resources/tools-software/sigmastudio/toolbox/adialgorithms/automaticspeakereq*
2. *https://ez.analog.com/dsp/sigmadsp/f/q-a/64304/adau1701-sigmastudio-rew-auto-eq*

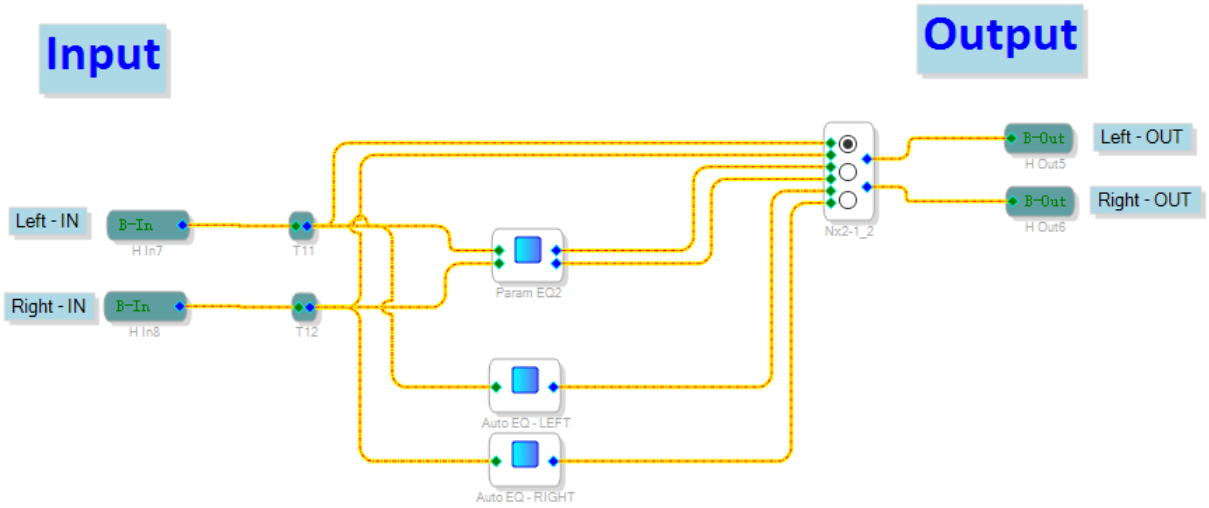


Figure 2: User EQ Block

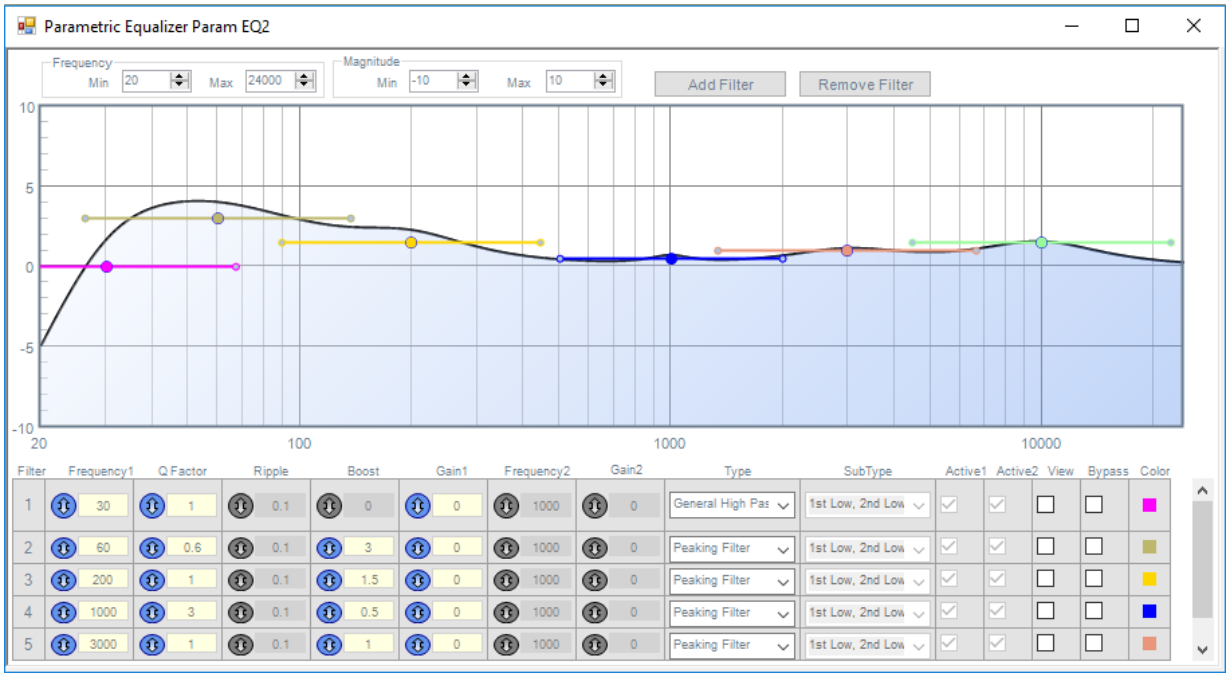


Figure 3: Parameter EQ Block

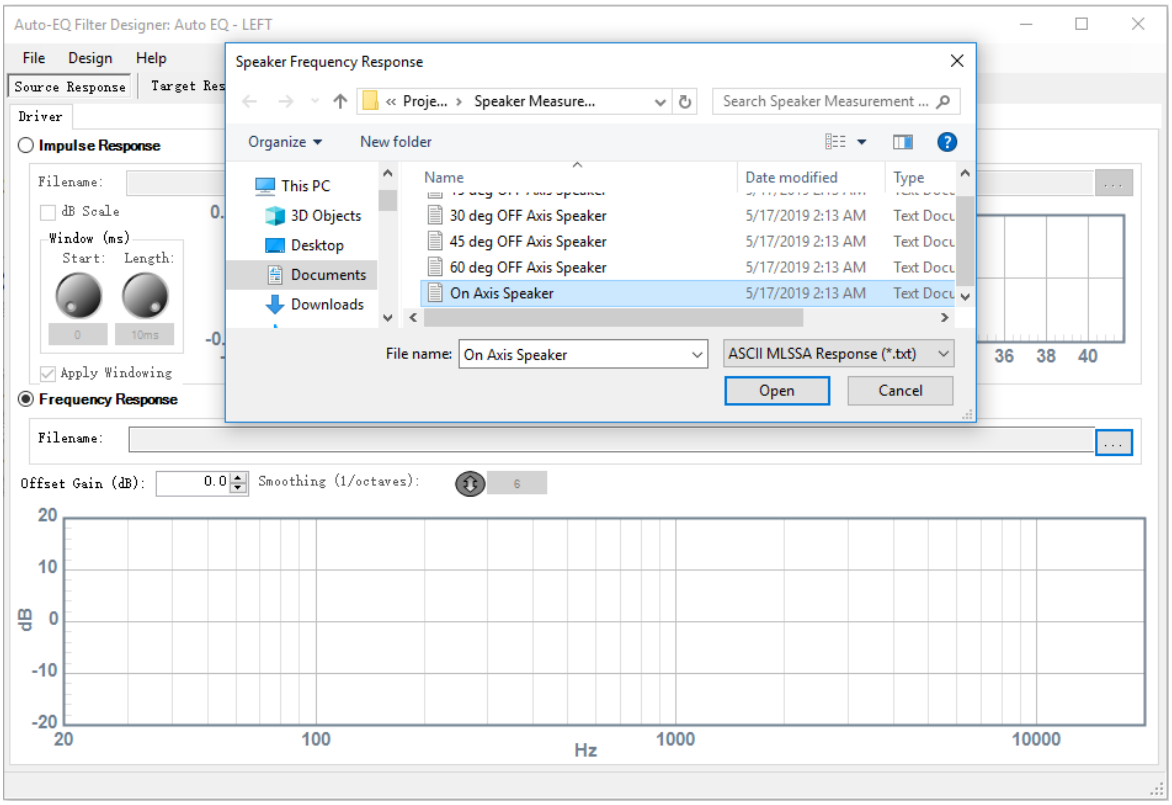


Figure 4: Auto EQ Block

A dedicated download tool: *EVAL-ADUSB2EBZ (from analog device) or USBi/Free USBi* (low cost) is need for SigmaStudio online design and F/W burn into EEPROM. There is an onboard USBi connector for online debug and programing, show as figure 4, please note that only *SCL, SDA and GND* signals are available, there is no any power supply output and the rest PINs are no connected.

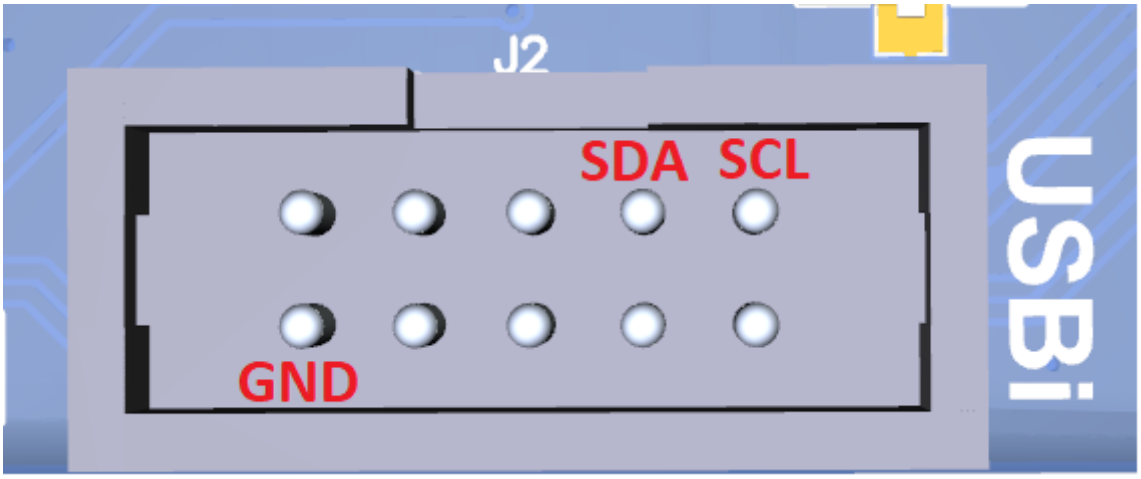


Figure 5: USBi connector

- **Audio OP-Amp swapping:**

  A traditional DIY way is by replacing different kind of op-amp to have all kind of sound experience as they expect, based on this consideration we put changeable op-amp into this product design by using a typical DIP-8 footprint. user can replace with same package size and it is easy to swap them anytime.

  * Please note that we use high-end one OPA1602 SMT package on SY-DAP1002 Rev1.0 version.

  Change Points: refer figure 1&2 blue area

  - SY-DAP1002 and SY-DAP2002: ***U1; U2***

- **Audio Cap Swapping:**

  We use audio grade capacitor for audio coupling path to get best audio quality, user can replace some other type capacitor to get a good taste for themselves, be sure use same rating material, eg.10uF/16V, and the polarity is correct.

  Change Points: refer figure 1&2 yellow area

  - SY-DAP1002: ***C1; C6; C93; C86; C70; C69; C9; C12; C17; C20***
  - SY-DAP2002: ***C1; C6; C69; C70; C86; C93; C9; C12; C17; C20***

- **LC filter Film Cap Swapping:**

  User also can change the film capacitor on class D demodulation output stage to has better matching on their system based on transducer impedances, please note that we use TDK B32529 series MKT film cap, be sure use same or higher quality capacitor otherwise the performance will degrade.

  Change Points: refer figure 1&2 brown area

  - SY-DAP1002: ***C63; C73; C80; C89*** **;** SY-DAP2002: ***C63; C73; C83; C90***

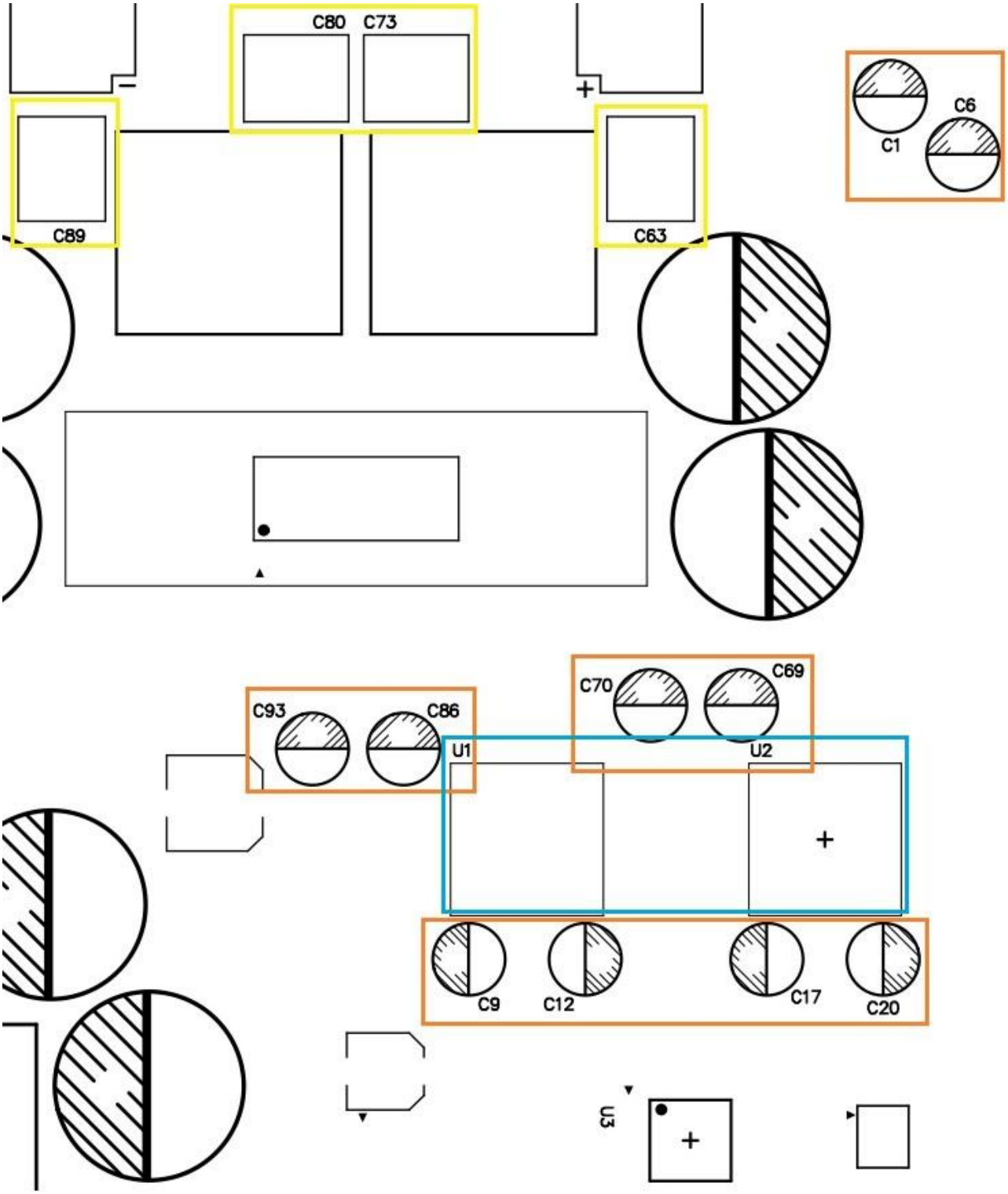


Figure 6: SY-DAP1002 Components location

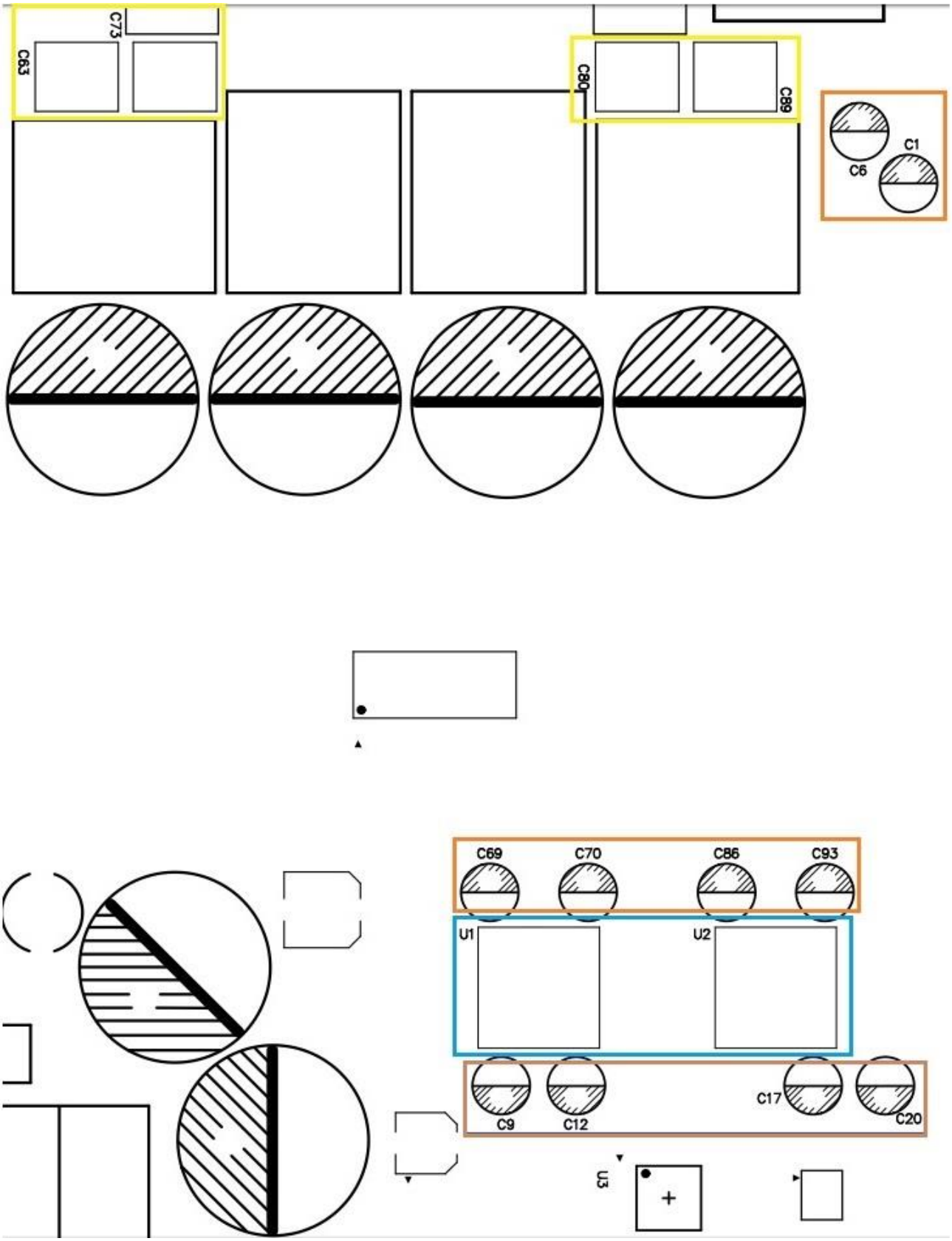


Figure 7: SY-DAP2002 Components location

- **Analog Input Sensitivity adjusting:**

  By default, the design setting on this product, compatible with most of the DAC device including low level output from a cell phone, it takes 1Vrms input level for a sensitive input to get rate output power. But in some case user keep using other high level output DAC device and the output level is hard to adjust at some point, then take this case into account, by changing a smaller setting in circuital will be a good implementation for using higher level input device.

  Below figure showing that by change 2 resistor (red marked) which are close to DSP(U3) can adjust input sensitive level as you want.

  Please refer to below function and a common table for reference:

  ***R* = (*Rms Input Voltage*) × 10KΩ - 2KΩ**

RMS Input Voltage (V)	Resistor Value (kΩ)	Remark
1V	8.2(default)	1%; 0603 size
2V	18	1%; 0603 size
3V	28	1%; 0603 size

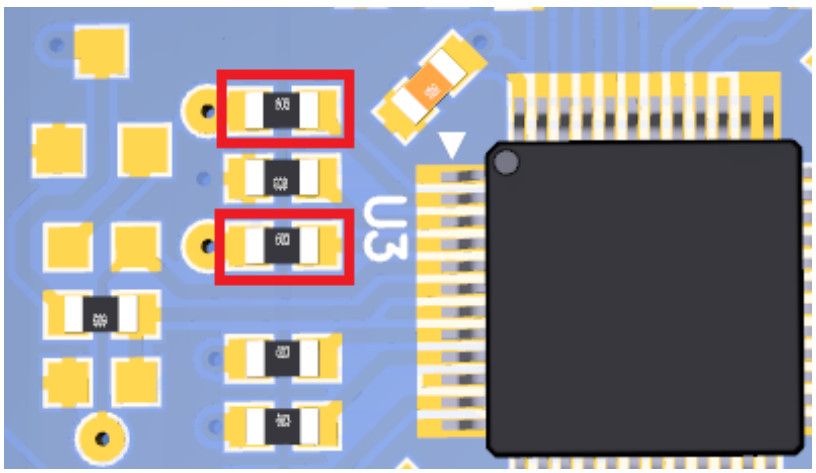


Figure8: Input sensitivity resistor

Q&A

Q	**TPA3250 vs TPA3255 which one is better?**
A	TPA3250 is better than TPA3255 regarding THD,Noise and Efficiency,TPA3250 design is smaller and more compacted, the advance of TPA3255 is only can output higher power, but has higher thermal lose also. they are the same level on audio quality point of view.
Q	**Why use DSP in this product?**
A	In the past many people used to change or upgrade the OP-Amp or analog circuit which limited to achieve a good implementation on a whole audio system, with a powerful DSP you can make many things more wonderful in digital world, for example you can design your own custom EQ like High/low pass, crossover,bass,treble,loudness control,etc. Just leave it as is if you don't want touch DSP (flat EQ).
Q	**How can I access the DSP for design my own EQ**
A	There is a USBi download connector that giving user directly connect to ADAU1701 DSP,all you need to do is make your individual design and then download to on board EEPROM,please note that MUST use our SigmaStudio design template(please get from our website) for furtuer EQ design and modification.
Q	**how is the OP-AMP performance, do we need change it?**
A	the OP-AMP is OPA1602 sound plus series and performance is very good, but change OP-AMP always fun of DIY. Only Rev1.0 available and Rev1.1 change to other common part like NE5532.
Q	**What is the voltage on amplifier power rail?**
A	TPA3250 - 30V; TPA3255 - 37V,44V Max
Q	**What DIY stuff can be done in this product?**
A	We put many efforts to achieve this high quality customized design, for detail DIY please refer to previous sections. Please note that any other change is high risk damage the whole product and result in invalid warranty
Q	**What is cooling way ?**
A	For SY-DAP1002, as it is lower power output and power dissipations, use internal bottom side conductive to PCB surface and plus external heatsink. For SY-DAP2002, as higher output power and power dissipations, beside using a larger heatsink, an active cooling way by using a FAN to have fully thermal management. Please note that there is a FAN noise(>20dB) when is it active trigger by sensor.

Revisions

Revision	Change Logs	Date
1.0	Initial version	Nov,2020