

## PSU12SA

### Power Supply Unit for Active Amplification System

#### Features

- Supply for DCN23/24 digital crossover module
- Supply for Power Amplifier modules
- Mains filter low power section
- Softstart circuit
- Auto Start / Auto Sensing circuit
- Auto StandBy after app. 12minutes
- Mute control
- On / StandBy LED
- 12 pcs Power Electrolytic Capacitors

#### Applications

- Active Amplification Systems
- High End Stereo setup
- Supreme Surround Sound Systems

#### Description

PSU12SA is a complete power supply unit with many features. It provides power for DCN23 or DCN24 and a number of PA3CC or PA6CC or other high quality amplifier modules. PSU12SA has separate linear regulated voltages of 3.3V, 5V and +/-11V to supply the DCN23 or DCN24. An input sensing circuit keeps an eye on signal inputs at DCN23 or DCN24 to auto start the power amplifiers. A switch selects between ON - STAND BY - AUTO SENSING to ease the use in daily life. If on or signal is present this switches the transformer relay on. The transformer ramps up the 12 pieces low ESR capacitor bank by soft start circuit limiting inrush current to about 7A. When ready, the power amplifiers are unmute by **pullup** to GND. There are two LED's to indicate STAND BY or ON. PSU12SA will ensure enough resources for the power amplifier modules to easily drive, even difficult speaker impedances.

#### PSU12SA Module

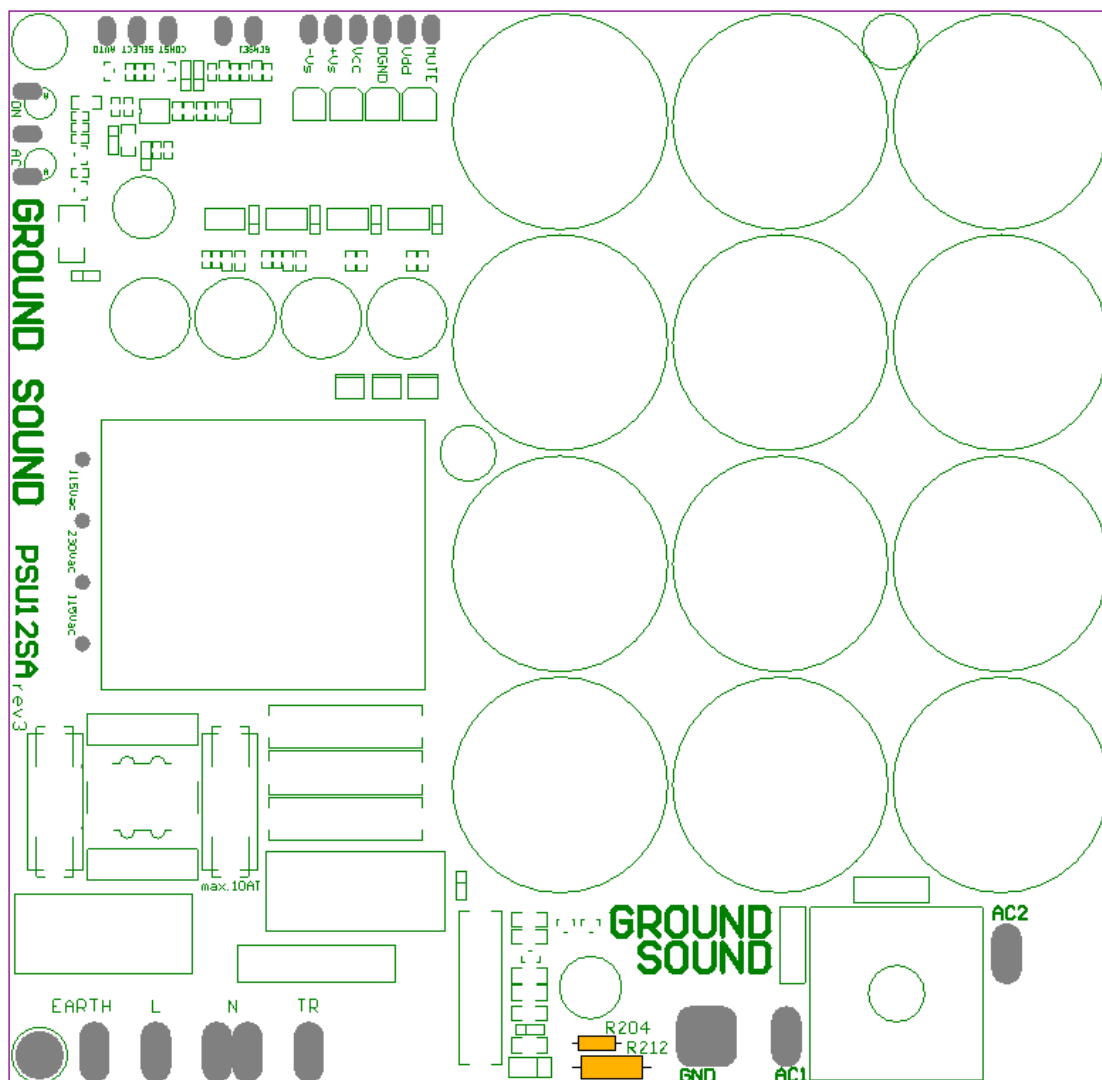


### Operating Conditions

	Min	Typ	Max	Units
Mains voltage supply, 230Vac version	210	230	240	Vac
Mains voltage supply, 115Vac version	105	115	120	Vac
Mains frequency	50		60	Hz
Mains fuse, low power section		T200		mA
Mains fuse, switched power transformer		T6,3	T10	A

### Technical Specifications

	Min	Typ	Max	Units
Linear regulated supply Vdd (190mA) Dgnd	3,1	3,3	3,5	V
Linear regulated supply Vcc (190mA) GND	4,8	5	5,2	V
Linear regulated supply +Vs (180mA) GND	+11,55	+11,65	+11,75	V
Linear regulated supply -Vs (180mA) GND	-11,75	-11,65	-11,55	V
Softstart inrush current		7		A
Nominal transformer secondary voltage			2 x 67	Vac
Nominal transformer power			2300	VA
Power capacitor bank, capacity		56.400	144.000	μF
Power capacitor bank, voltage	63	100	100	Vdc
Auto switch off delay	11,5	12	12,5	min



**Connection pads on top side (also available on bottom side)**

Label	Type	Description
EARTH	Mains Power	Connects mains earth to chassis through screw/metal distance
L	Mains Power	Live mains input, 230Vac or 115Vac
N	Mains Power	Neutral mains input and neutral power transformer primary
TR	Output	Live output power transformer primary, switch with softstart
GND	Input	System ground power transformer secondary CT entry
AC1	Input	Power transformer first secondary
AC2	Input	Power transformer second secondary
MUTE	Output	Mute control for power amp, open collector <b>pullup</b> to GND (20mA)
Vdd	Output	Linear regulated 3,3V refer DGND, digital circuit supply
DGND	Output	Digital ground, digital circuit supply
Vcc	Output	Linear regulated 5V refer GND, AD/DA converter supply
-Vs	Output	Linear regulated -11,65V refer GND, OP-AMP negative supply
+Vs	Output	Linear regulated +11,65V refer GND, OP-AMP positive supply
SENSE	Input	Signal auto-sensing input, pad beside connects shield
CONST	Output	+9V output for operation switch
SELECT	Input	Input selector for operation switch
AUTO	Output	Auto-sensing output for operation switch
ON	Output	LED D5 anode indicates ON, pad between ON & AC is common cathode
AC	Output	LED D6 anode indicates StandBy, pad between ON & AC is common cathode

**Connection pads only available on bottom side**

Label	Type	Description
+V	Output	Positive voltage supply for power amplifier modules
GND	Output	Star ground, connect DCN23/24 Agnd and power amplifier modules GND
-V	Output	Negative voltage supply for power amplifier modules

**Power amplifier supply**

The power amplifier supply is a classical symmetrical unregulated supply and its input pads are AC1, AC2 and GND at the topside beside the big bridge rectifier. PSU12SA has 12 snap-in capacitors and will normally be supplied with 4700µF/100V Nichicon Gold Tune capacitors. It is possible to have other values installed example 12.000µF/63V Panasonic capacitors if lower amplifier rail voltage is required. The power transformer normally has two separate secondary windings. If there is doubt about how to connect the transformer the easiest way to find out which wire goes where is: Put mains on the primary side and then connect two wires of the secondary side and measure the **ac** voltage on the other two secondary wires. When the meter shows a voltage of approximately 2 x specified voltage (example 2 x 45Vac often gives around 95Vac unloaded) the right connection of the secondary is found. The two connected wires will be ground GND. One of the other two wires connects to AC1 and the other to AC2.

The output pads of the power amplifier supply are located on the bottom side and the markings are +V, -V and ground GND. It's highly recommended to twist the three wires for each amplifier module.

**Grounding GND**

The ground plane of PSU12SA is a star ground and the centre of this star is the power amplifier supply's GND pad on the bottom side. The construction of PSU12SA and DCN23/24 has been made to avoid ground loops to minimize hum and noise. If the assembly instructions are followed this will ensure highest performance.

## Softstart circuit

The PSU12SA includes a softstart circuit which is fast on. It monitors the voltage of the capacitor bank and switches the relay and mute output when the threshold level is reached. This threshold level is set by two resistors R204 and R212. The standard setting is for our TR600 transformer at 2 x 45Vac, but other values can be supplied.

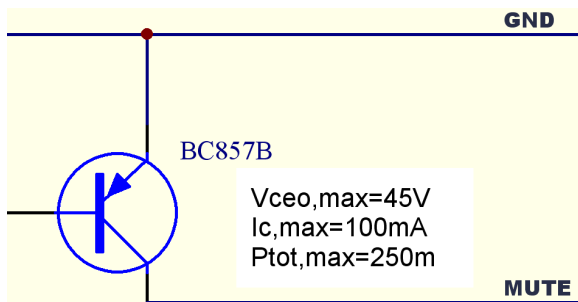
## Softstart circuit resistors

Transformer nominal secondary voltage	R204	R212
2 x 35Vac (+/-49Vdc)	10kΩ/0,7W	0R
2 x 40Vac (+/-56Vdc)	18kΩ/0,7W	0R
2 x 45Vac (+/-63Vdc)	27kΩ/0,7W	0R
2 x 50Vac (+/-70Vdc)	33kΩ/0,7W	100R/5W
2 x 55Vac (+/-77Vdc)	39kΩ/0,7W	100R/5W
2 x 60Vac (+/-84Vdc)	33kΩ/0,7W	150R/5W
2 x 65Vac (+/-91Vdc)	39kΩ/0,7W	150R/5W

Please refer to the PSU12SA outline above for location of R204 and R212 marked orange.

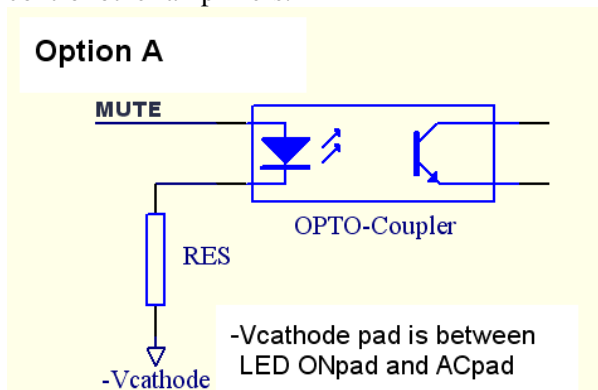
## Mute circuit

The mute circuit ensures pop free switching of the system and it is a part of the softstart circuit. It switches on at the same threshold level as the relay. The output is an open collector PNP transistor which **pullup** to GND.



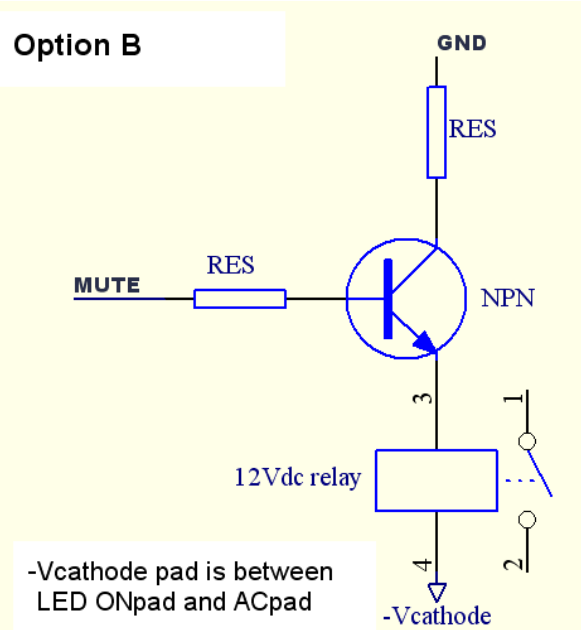
The above schematic shows the mute output circuit. The output needs no glue components if it has to control our own power amplifier modules PA1CC, PA3CC and PA6CC.

But other amplifier modules might need some glue electronics. Here are 3 examples of how to control other amplifiers:



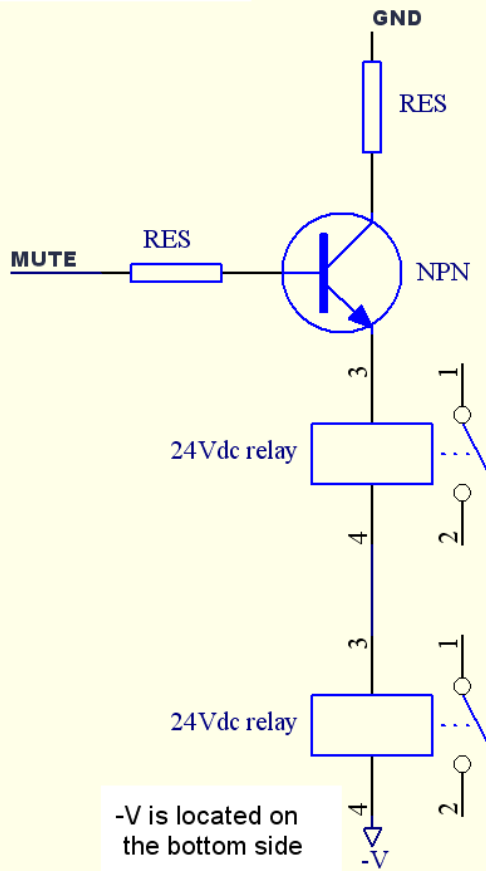
Option A shows the simplest way to control a low power enable control input of the amplifier module. The transistor output might have to be a Darlington coupling and/or have to have a series resistor.

-Vcathode is about -16V.



Option B shows the circuit with a relay output. The relay can have more than the one set of contacts shown on the schematic which make it possible to control either signal input or output of the amplifiers.

## Option C



Option C shows how to implement two relays which offers the possibility of more sets of contacts. Note that the circuit now is supplied from the power amplifier supply to ensure enough voltage for the relays.

There is no value or types on the schematics because they all depend on each other and the amplifier modules that it has to control. We might be able to help out if needed.

### Regulated supplies

The low power section features regulated supplies which can supply **one** DCN23/24. It is designed for absolute best performance. The low power section also features a mains power filter to reduce degrading mains noise and spikes. All supply voltages are separated at the secondary side of the two transformers. This ensures that the digital supply voltage 3,3V will not interfere with the converter supply voltage 5V and the OP-AMP supply +/-9V. The digital supply has its own ground DGND which will be wired separately all the way to DCN23/24. The regulation is performed by low drop out regulators (LDO) and in front of them 4 pcs 1000µF capacitors take care of energy storage.

### Autostart/sensing circuit

To make the daily use of the amplifier system much more convenient, PSU12SA has been designed with an automatic sensing system. The circuit incorporates an operation switch with three positions AUTO - OFF - ON. In AUTO mode the circuit amplifies the sense output from DCN23/24 and compares it with a threshold level. When the input signal is over the threshold level, the ON relay switches on the power amplifier supply. The circuit has a delayed switch off time of approximately 10 minutes after music signal off. There are two LEDs indicating StandBy(AC present) and ON.

## Wiring

The **amplifier** supply connects on the bottom side and it is recommended to start by soldering these wires. This includes 3 wires per amplifier module normally blue (-V), black (GND) and red (+V) multi-core wire between 0,75mm<sup>2</sup> and 1,5mm<sup>2</sup>. It's highly recommended to twist the three wires for each amplifier module rather than using thicker wires to minimize crosstalk between wires for different parts of the system.

The **DCN23/24** crossover filters analogue ground **AGND** must also be connected to the star ground and we recommend using a white 0,75mm<sup>2</sup> wire for easy location of it. This wire also connects the star ground to chassis metal at the input signal connector through ground lift on DCN23/24 via CH pad. This ensures very low noise and hum injected from mains power connection and avoids ground loops.

After soldering the wires on the bottom side, it is recommended to mount the module for easier installation of the rest of the wiring. Remember to put thermal conductive compound (silicon-free paste or goop if you prefer) between bridge rectifier and chassis metal.

The **mains** power wiring can be done in two ways, either three separate wires with an additional isolation hose/heat-shrinkable tube or simply a three lead mains cable. Connect blue to N pad, yellow/green to Earth pad and the last to L pad probably black. The mains wires should be between 0,75mm<sup>2</sup> and 1,5mm<sup>2</sup>. It has to be emphasized that the mains wiring has to be double isolated.

The **transformer's** primary wiring has to be double isolated too, which our transformers are and others normally are.

It is possible to solder FASTON tabs at all the high power connections - if preferred, except the amplifier power connections on the bottom side +V, GND and -V. Experience tells us that these "Easy mounting/easy service" connections often are the course for early service, whereas soldering connections lasts. This is the reason we rely mainly on soldering pads.

It can be a bit tricky to solder the secondary side wires if the transformer has solid conductor wires. Care should be taken not to melt the plastic isolation. Our transformers are equipped with multi-core wires on the secondary side, with few exceptions, for easy assembly.

The **regulated supply** for DCN23/24 will sufficiently be wired with 0,2mm<sup>2</sup>. It is recommended to twist Vdd/DGND pair and -Vs/+Vs pair.

The **mute control, operation switch and LED** wires will also be sufficiently wired with 0,2mm<sup>2</sup>. There is no need for twisting the wires for operation switch or LED's, but it helps to keep them together. These are control signals and it's no problem with 1m wires, if it is desired. Example: Mounting on front panel.

The **sense input** require a shielded cable. The sense input connects to the DCN23/24 sense output. To avoid a ground loop the shield is only connected at PSU12SA, because the pad on DCN23/24 isn't connected to AGND and it's only there for mechanical strength.

## Mechanical dimensions

The mounting of PSU12SA requires:

4 pcs M3 x 16mm screws

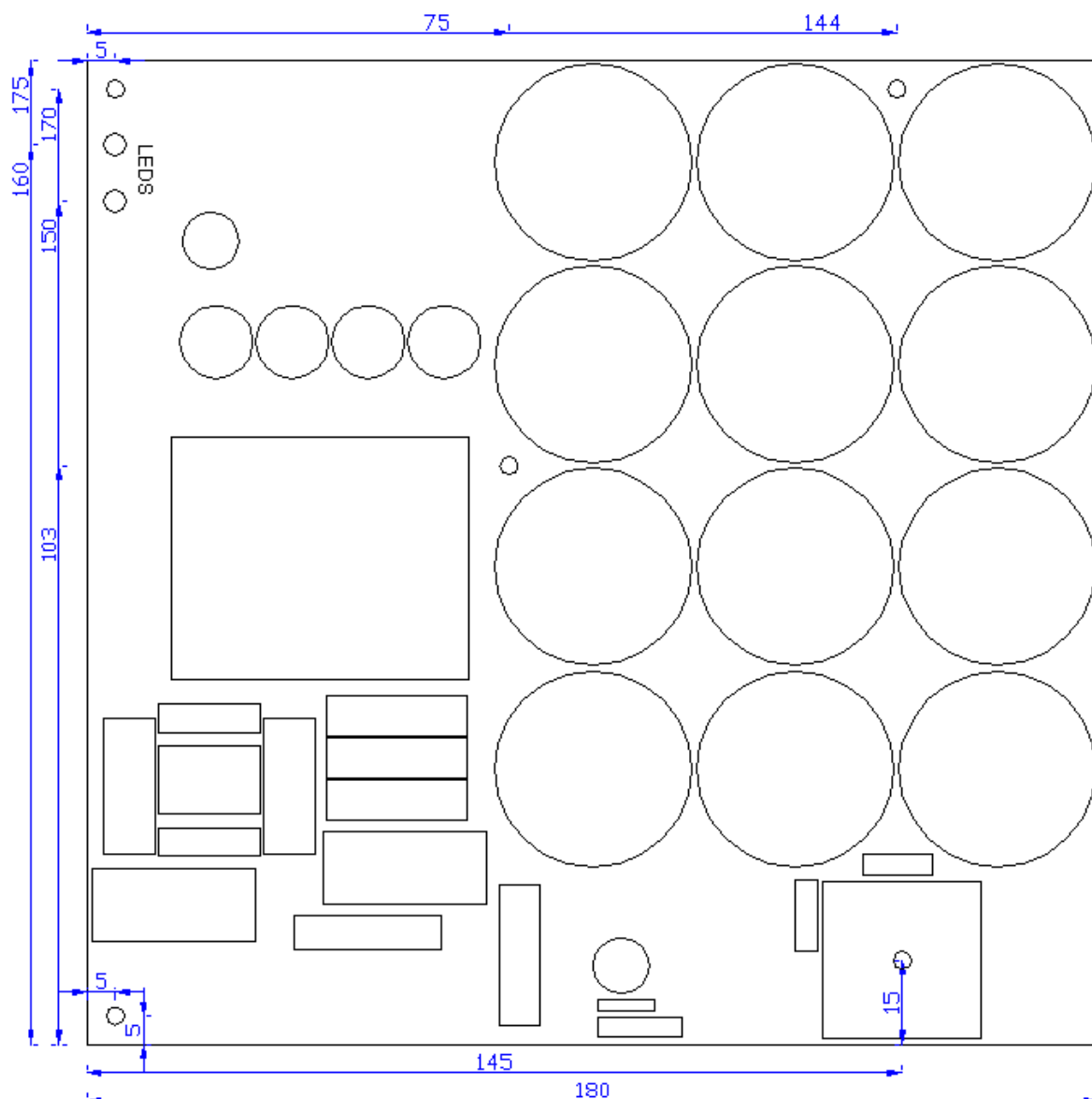
1 pc M3 x 6mm screw

4 pcs M3 x 10mm distances

1 pc M3 x 10mm screw M-thread hexagon body

5 pcs 3mm spring washers

1 pc 3mm plain washer



Ground Sound reserves the rights to make alterations without prior notice.

Revision A: 2008-10-13      New version of PSU12SA = rev3  
 Revision B: 2010-07-30      Dimension drawing updated