

## **SDV1024-600: SWITCH-MODE POWER SUPPLY MODULE FOR CLASS D AUDIO AMPLIFIERS**

### **FEATURES**

- **HIGH POWER: 500W RMS<sup>1</sup>**
- **HIGH EFFICIENCY >90%**
- **HIGH SWITCHING FREQUENCY: 200KHz.**
- **SIMPLE CONTROL POWER SUPPLY REQUIREMENT<sup>2</sup>**
- **THERMALLY EFFICIENT PACKAGE<sup>3</sup>**  
-INTEGRAL HEATSINK
- **SHORT CIRCUIT PROTECTION**
- **OVERVOLTAGE PROTECTION**
- **SOFT START**
- **LOW QUIESCENT CURRENT**
- **OTHER POWER OPTIONS AVAILABLE<sup>1</sup>**
- **LOW COST**
- **LIGHTWEIGHT**
- **CUSTOM PSU DESIGNS AVAILABLE<sup>4</sup>**

#### **NOTES**

- 1) Other power options include 2000W, 1000W, 300W, 150W and 75W. Alternately, custom power levels can be produced.
- 2) Additional heatsinking required for continuous operation into a resistive load.
- 3) Contact Magnatec Ltd. for more details of these options

### **APPLICATIONS**

- **PSU FOR AUDIO POWER AMPLIFIER**
- **PSU FOR ACTIVE SPEAKER SYSTEMS**
- **POWER CONVERSION**
- **GENERAL PSU APPLICATIONS**



### **DESCRIPTION**

The SDV1024-600 is a switch-mode power supply unit, which is designed to power class D audio power amplifier modules. The unit is set-up at manufacture for operation from 115Vac or 230Vac. It is possible to simply convert between the two input ranges via internal link settings.

The supply contains an input filter, rectifier, power transistors, isolating power transformer, drive electronics, control circuitry, output rectifier and output filter. In addition, a small linear power supply is included to power the power supply module control circuitry and a class D amplifier module (SDV1015-600). The addition of extra output de-coupling capacitors increases the power supply drive capacity.

The unit also provides a control signal that can be used to mute the output of an amplifier module at power on and off.

For a universal input supply range the companion power factor corrected pre-regulator module can be used. Contact Magnatec Ltd for more details of this and other options.

# SPECIFICATIONS

## Absolute maximum ratings



|   |               |
|---|---------------|
| Mains In , $M_{IN}$ .....                   | +400 V        |
| Operating free air temperature, $T_A$ ..... | -10°C to 40°C |
| Storage temperature range, $T_{stg}$ .....  | -40°C to 70°C |

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated “recommended operating conditions” is not implied.

## Recommended operating conditions

|                                       | MIN | TYP | MAX | UNIT |
|---------------------------------------|-----|-----|-----|------|
| MAINS IN, $M_{IN}$ (230Vac operation) | 206 | 230 | 254 | Vac  |
| MAINS IN, $M_{IN}$ (115Vac operation) | 103 | 115 | 127 | V    |
| OPERATING FREE AIR TEMPERATURE, $T_A$ | 10  | 25  | 40  | °C   |

## Electrical characteristics at a free air temperature of 25°C

| PARAMETER | NOTES/TEST CONDITIONS  | VALUE    |                   |            | UNIT        |
|-----------|--|----------|-------------------|------------|-------------|
|           |  | MIN      | TYP               | MAX        |             |
| $P_o$     | CLASS D music power rating<br>$R_L = 4\Omega$  | 450      | 600               | 700        | W           |
| $P_{max}$ | Continuous Power ratings<br>$R_L = 8\Omega$ resistive load<br>$R_L = 4\Omega$ resistive load<br>$R_L = 2\Omega$ resistive load |          | 300<br>450<br>600 |            | W<br>W<br>W |
| VCC+      | Amplifier positive supply voltage<br>$R_L = 39\Omega$  | 11.75    | 12                | 12.25      | V           |
| ICC+      | Amplifier positive supply current  |          |                   | 400        | mA          |
| VCC-      | Amplifier negative supply voltage<br>$R_L = 39\Omega$  | -8.2     | -8                | -7.8       | V           |
| ICC-      | Amplifier negative supply current  |          |                   | 50         | mA          |
| SD        | Amplifier shutdown control<br>During normal operation<br>At turn on or turn off  | 0<br>4.5 | 0.2<br>5          | 0.5<br>5.5 | V<br>V      |
| VRAIL     | Amplifier main power rail<br>Connected to SDV1015-600 with input audio signal at +/- 0.1V.                                     | 70       | 72                | 76         | V           |
| $f_{sw}$  | SWITCHING FREQUENCY  | 50       |                   | 200        | KHz         |

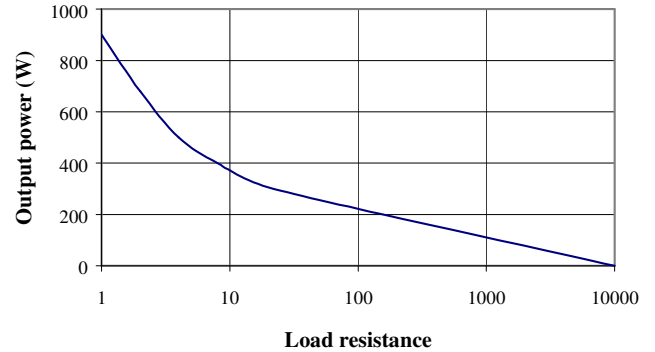
Semelab Plc. reserve the right to change the products shown on this datasheet in the interest of improved specification. No responsibility is assumed for the use of information contained herein, nor for any infringement of patent or rights of others that may result from such use. No license is granted by implication or otherwise under any patent or patent right of Semelab Plc.

# OUTPUT POWER and EFFICIENCY



The power supply is designed to track the power requirements of the audio amplifier. In quiescent mode, the unit consumes approximately 3W of power. For audio applications, in the standard module, the output power is limited to 450W continuous into a 4Ω load or 600W continuous into a 2Ω load. The unit is able to operate with output loads from no load down to less than 1Ω. The output power versus load characteristics are shown below. Note for continuous operation into a resistive load, the module will require additional heatsinking.

When the unit is run continuously the efficiency of the module will typically be greater than 85%. In idle mode of with audio applications the efficiency will typically be greater than 95%.



## THERMAL EFFICIENCY

The SDV1024-600 power supply module comes housed in an aluminium package. Internal to the package, the power components are thermally bonded to the housing. The housing is also electrically bonded to the supply ground. The thermal resistance of the module package in free air is 2°C/W ( $\theta_a$ ). The contact thermal resistance of the module can be assumed to be less than 0.5°C/W ( $\theta_c$ ).

To decide whether additional heatsinking is required the continuous power level into the load must be determined. Assuming an efficiency of 95% means that 5% of the rated power will be dissipated inside the power supply module. For example, for a continuous output power of 300W, 15W will be dissipated inside the module.

Once the power dissipation inside the module is known the temperature rise using the module at this power can be calculated. The temperature rise is given by:

$$\text{Temperature rise} = \theta_a * \text{power dissipation} \quad (^\circ\text{C})$$

With the example above, the temperature rise would be 30°C above ambient temperature. The operational temperature of the module should not exceed 70°C. If the calculated temperature rise and the maximum ambient temperature for operation will exceed this figure, then additional heatsinking will be required. If heatsinking is required then the module can be mounted onto an additional heatsink. When mounting to a heatsink, it is recommended that a high thermal conductivity electrical insulating mat is used. If the thermal resistance of the new heatsink is  $\theta_h$ , then:

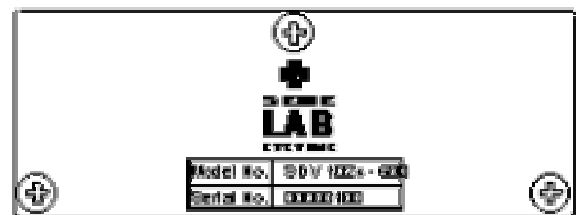
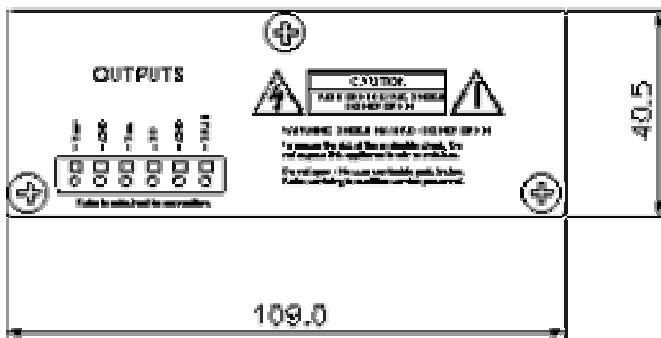
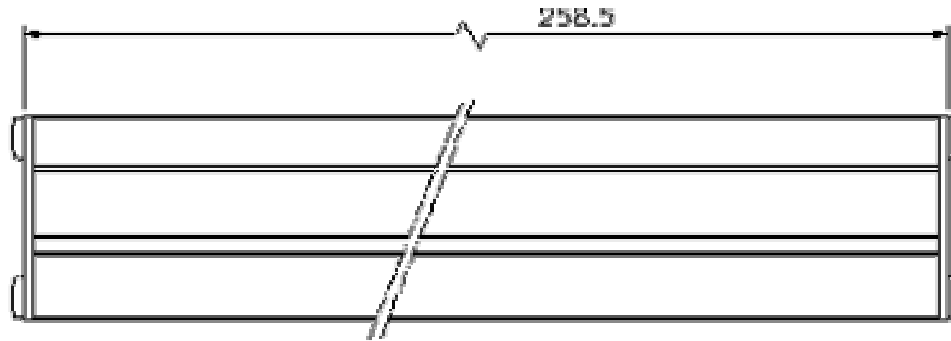
$$\text{Temperature rise} = (\theta_c + \theta_h) * \text{power dissipation} \quad (^\circ\text{C})$$

If a heatsink with a combined thermal resistance of 1.0°C/W is selected, then in the above example the temperature rise above ambient would be 15°C.

# MECHANICAL DETAILS

## Package dimensions

(All dimensions in mm)



Semelab Plc. reserve the right to change the products shown on this datasheet in the interest of improved specification. No responsibility is assumed for the use of information contained herein, nor for any infringement of patent or rights of others that may result from such use. No license is granted by implication or otherwise under any patent or patent right of Semelab Plc.

## Connections

The power supply module has been designed such that connections can be made with screw terminals or direct soldering onto the PCB. The screw terminal connectors are shown below. When viewing a connector face on pin 1 is the left most connection:



| Way | Function | Value     | Description   |
|-----|----------|-----------|---|
| 1   | VCC+ :-  | +12V      | Amplifier control positive supply voltage           |
| 2   | GND      | 0V        | Supply ground                                       |
| 3   | VCC- :-  | -12V      | Amplifier control negative supply voltage           |
| 4   | SD       | +5V or 0V | Amplifier shutdown – controls power on/off sequence |
| 5   | GND      | 0V        | Supply ground                                       |
| 6   | VRAIL    | +72V      | Main power rail                                     |

## OPTIONS

- **Alternative output voltages** - available on request subject to minimum order quantity.
- **PFC pre-regulator module** - universal input 90Vac to 270Vac and power factor corrected.

# GLOSSARY



|                          |  |
|--------------------------|--|
| Active speaker           | Integrated loudspeaker and amplifier.  |
| Audio passband           | Audio spectrum from 20Hz to 20KHz.   |
| Anti-clip                | Circuit to correct for excessive input signals.  |
| Class D                  | Amplifier using pulse width modulated output stage.  |
| Decibel                  | Measure of relative power $\text{dB} = 10\log P1/P2$   |
| EMC                      | Electro magnetic compatibility   |
| ESR                      | Equivalent series resistance   |
| Filter attenuation       | Performance of a filter at a specific frequency or band of frequencies.                                    |
| Harmonic                 | Higher multiple of a frequency   |
| (K)Hz                    | (Kilo) Hertz, frequency measure  |
| Inherent efficiency      | Measure of the efficiency of the amplifier module alone.   |
| Input impedance          | Impedance looking into the amplifier.  |
| Latency                  | Description of the dynamic range of music  |
| Modulation Factor        | Ratio of input signal amplitude to maximum permissible signal amplitude.                                   |
| Noise floor              | Residual noise level of the amplifier expressed in dB.   |
| Output impedance         | Source impedance seen looking into the amplifier output.   |
| PCB                      | Printed circuit board  |
| PFC                      | Power factor corrected   |
| p-p                      | Peak to peak measurement   |
| PSU                      | Power supply unit  |
| PWM                      | Pulse width modulation   |
| Quiescent current        | Current consumed by amplifier with no audio signal input.  |
| Rms                      | Root mean square = $V_{p-p}/(2\sqrt{2})$   |
| Slave module             | Additional power output stage driven from an optional master unit.   |
| SNR                      | Signal to noise ratio  |
| Switching frequency      | Sample frequency of PWM.   |
| THD                      | Total harmonic distortion - measure of the accuracy with which an amplifier replicates an input sine wave. |
| Theoretical output power | Maximum output power of amplifier module, alone assuming 100% efficiency.                                  |
| Thermal resistance       | Measure of heatsink efficiency   |
| Total coupled power      | Actual power coupled from amplifier to load (loudspeaker)  |
| UPS                      | Uninterruptable power supply   |