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

FEATURES

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

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 csn 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

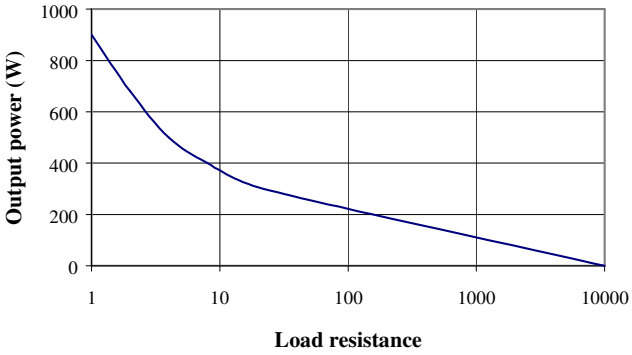
Electrical characteristics at a free air temperature of 25°C

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

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 (θ_a). The contact thermal resistance of the module can be assumed to be less than 0.5°C/W (θ_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:

Temperature rise = θ_a * power dissipation (°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 θ_h, then:

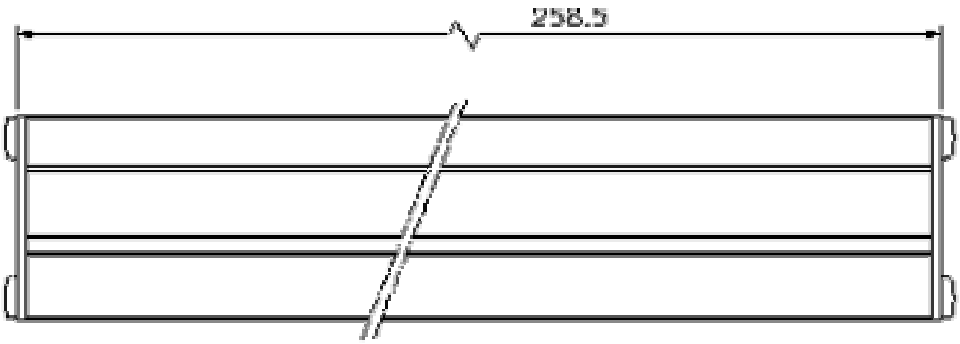
Temperature rise = (θ_c + θ_h) * power dissipation (°C)

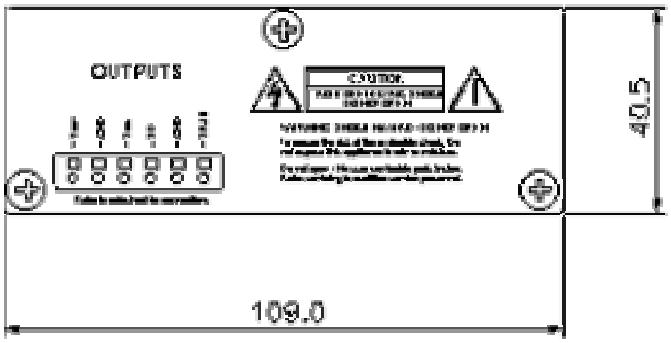
If a heatsink with a combined thermal resistance of 1.0°C/W is selected, then in the above example the temperature rise above ambient would be 15°C.

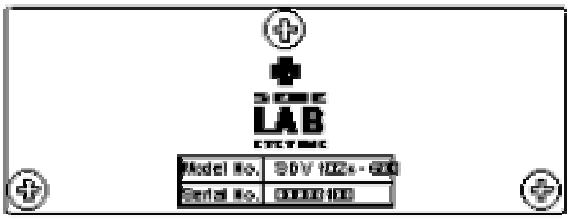
MECHANICAL DETAILS

Package dimensions

(All dimensions in mm)







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 dB = 10logP1/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 = Vp-p/(2√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