

Stonepath Power Systems Ltd.

Advanced technology for tomorrow!

"If we don't have a solution then there isn't one!"

Stonepath Power Systems Ltd. Custom Design Capabilities:
(For examples and pictures see bottom of page.)

The right mixture of resources for designing and testing of advanced power conversion technologies. With nearly all products just a variation of an existing well understood technology the breadboard stage is often not required. Time is spent to provide a functional proto-type, electrical and mechanical, that will be close to the final product, saving valuable development time and most important cost. Our development team has over 7 years of experience with poly-phase digitally synthesized and controlled power supplies and Inverters, both low and very high voltage. Our main designer has over 25 years of experience developing ultra low noise analogue circuits and power supplies some of which were used for Military Radar Research as well as University experimentation.

Past experience design team project experience:

General Power Conversion

1. DC to AC power conversion as well as 4 quadrant power supply design.
2. High power battery chargers.
3. Precision power supplies, low drift, high accuracy low and high power, low noise.
4. Current or voltage potential transformers to better than 0.0001% accuracy class.
5. Alternative power generation technology using converters such as AMPS, Sterling Engines, Thermo-acoustic Generator, Thermal converters, Solar, Wind etc.
6. Low cost single stage, low power turbine.
7. Low cost brushless alternator to 20,000 rpm
8. High efficiency and high power density flash boiler/steam generator design.

High Voltage

1. Low noise TWT and Klystron, EIA, EIK and Magnetron power supplies from 20 to 20kW either linear or state of the art digitally synthesized poly-phase switchers.
2. Modulators high speed push pull or single side pulse transformer magnetron type to greater than 400kW switching.
3. High voltage power supplies.
4. Transmitter subsystem automation using micro-controller.

The following is a partial summary of Stonepath's design capability

- Microcontroller, various common families design and layout

- Programming in C, embedded control and machine language
- FPGA and CPLD logic design and development
- High speed power i.e. switching >30 Vdc <10ns and >20 Amp power driver design
- Class 1 Standards Laboratory precision and stability is available if required.
- High power DC to over 20kW
- High Voltage switching power supplies to 40kV, and >20kW
- High Power Solid State Modulators greater than 1 Mega-watt.
- High power DC to AC, AC to DC, AC to AC, or DC to DC, 1 to 4 quadrant converters.
- Military and Industrial designs
- PCB layout and design including multi-layer
- Test and documentation of systems
- Debug and review a customer design for manufacturability and reliability .
- High frequency AC design, layout and test
- Mechanical design of enclosures and proto-type test

Equipment and Resources:

Software:

- Support for the more common DSP (TI & Freescale) & 32, 16 and 8 bit microprocessors.
- Common FPGA, Lattice, Xilinx etc.
- Schematic and simulation PCB software, PADS, Or Cad, Protel etc.
- Common Microsoft general Office packages for business
- Microsoft Visual C
- General graphics packages

Hardware & test Equipment:

- Assembly of SMD devices to 402 size, QFP packages etc., by hand
- 3D inspection system for surface mount
- Function and pulse generators to 5 ns.
- Digital storage oscilloscope 300MHz, with current probes and High Voltage to 40kV
- DC power supply sources various
- High Voltage DC sources, precision to 2kV, unregulated to 10kV
- High Voltage AC to 10kV
- High Power single phase AC to 6kW
- Various multi-meters and test probes to 40kV
- Steam generator 150lbs per hour up to 500psi,
- Metal/Plastic fabrication of parts typical electronic parts
- Sheet Metal fabrication

Examples of Custom Products

Some of these products that are available from our customers.

600 W Power Supply

- remote optical control, metering external voltage or current programming etc.
- current or voltage regulation mode
- 0 -25A, 0-28Vdc.
- very low noise forward converter design.

It was designed for our customer who manufactures a 25kV Power Tube pulse test set using external isolation box and transformer. Picture shows unit with test leads under operation.



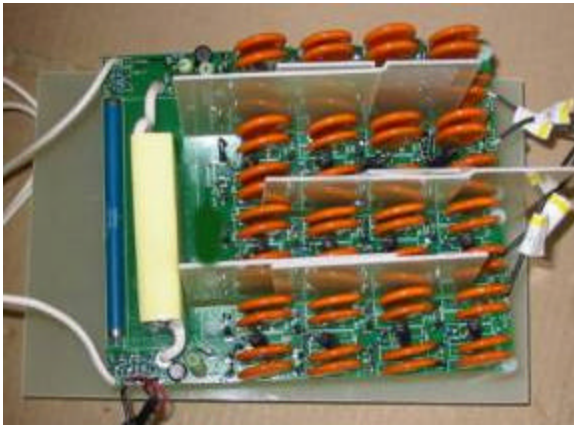
25kV, 600W Power Supply

The following pictures show the main control PCB and unpotted multiplier assemblies. It reused some of the power processing section of the 600W Forward converter, both designed for the same customer.

The power supply had the following features;

- Current or Voltage regulation modes.
- 120/240Vac operation.
- 600W power output.
- Remote programming via external analogue inputs.
- Variation of forward converter regulation operating at 80kHz.
- Used 4 multipliers to generate the 25kV output.
- Very low ripple, low DC drift and high precision.

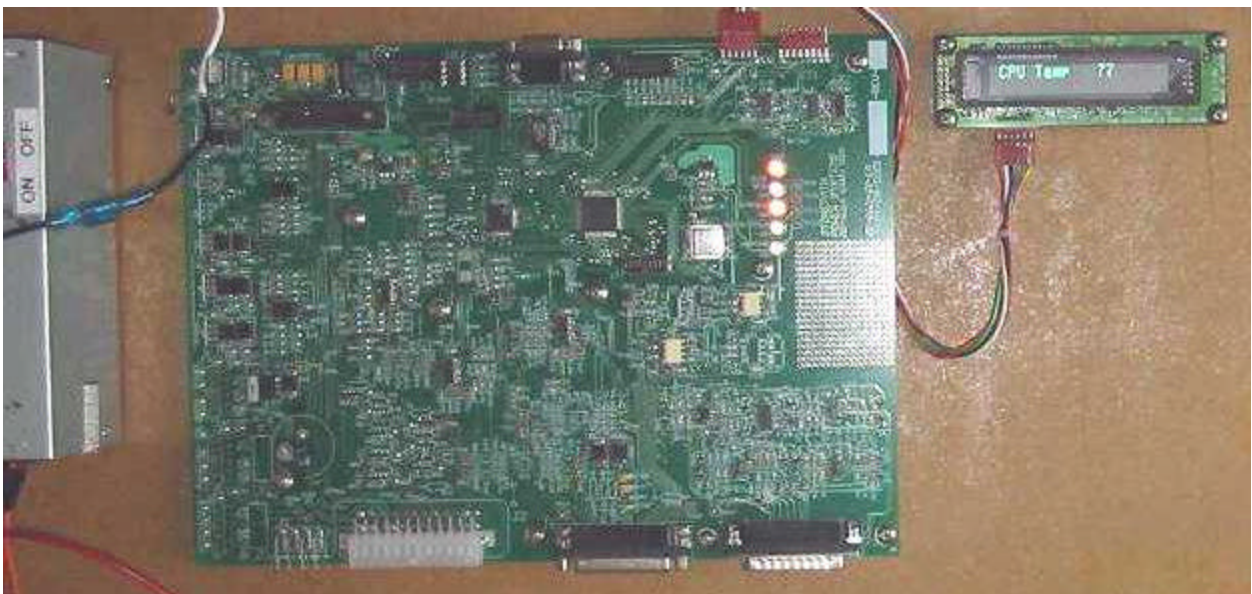




Microcontroller PCB for WoodGen System Automation

This PCB was designed for experimentation and control of Stonepath's Bio-mass fired Co-Generator.

- high density surface mount design
- 4 DC voltage outputs, up to 2 amp
- 3 PWM output up to 40Vp-p, used for driving AC valves.
- RS485/RS232 port
- LCD or VFD display interface.
- 12 thermal couple inputs, ultra low offset
- 20 general purpose analogue inputs.
- 4 opto-isolated inputs and 4 opto-isolated outputs
- ultra low power down sleep mode
- 16 key, keyboard interface
- on board isolated DC to DC converter for operation of digital electronics
- 8 open collector outputs for external control operation
- plus many other features



25W 1,900 High Voltage to Low Voltage Converter (picture not available)

This converter was designed for our customer to replace a TWT with a module that consisted of a power supply and solid state amplifier, the exact same size as the tube. The converter used the heater power supply to operate the low voltage converter electronics. Two versions were designed and tested, one was 1,300Vdc to 15Vdc and the second 1,950 Vdc to 15 Vdc. Both used Stonepath proprietary technology.

7kW 3,600V to 35V High Voltage to Low Voltage Converter (picture not available)

This converter was custom designed for our customer using Stonepath proprietary technology (patents pending) for a customer who had severe size constraints. The power converter was very compact yet remained very serviceable. No picture is available due to NDA requirements. The Power Supply was required to operate from a high voltage DC input, in this case about 3,600Volts and convert it down to 35Vdc @ 200 amp.

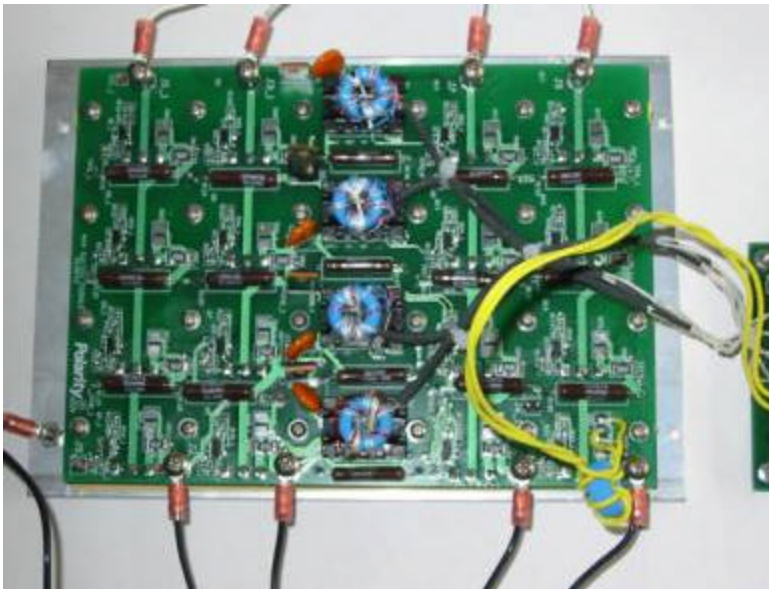
- Converts 3,600V DC to 35V @ 200amp.
- oil cooled, designed for Military Airborne system.
- 93 to 95% efficient.
- <54 cubic inches, over 130W per cubic inch.
- 80kHz operation
- -40 to 95 C operation

The design will lend itself to various mounting and cooling methods.

High Speed Modulator 200Amp, 2kV

The following two images are of a high speed pulse modulator switch designed for a customer. It utilized an array of power mosfets, located under the PCB in the first image. The second image is the driver and control PCB for the switch.

- Operate at up to 2,500 Vdc.
- 200amp fully short circuit protected, any duration
- 70ns switch time
- Drove a pulse transformer that operated a pulsed magnetron, used in a Radar system
- conduction cooled
- spacing is adequate for operation in air
- Heavily derated for Military operation
- Design may be extended for operation at 4,000V and 600A by increasing the PCB size.



Modulator Driver

The following picture is the driver for the above modulator switch.

- Output is 30V differential, 30 amp, may be programmed to any level.
- 10 ns rise and fall times
- Absolutely no ringing present drive output
- Modulator switch trip current level monitoring, may be adjusted.
- Modulator peak current set point adjustment
- Over duty, excessive pulse width and over PRF protected.
- ON board linear voltage regulators
- Optical isolated pulse in and fault out signals
- Military temperature range capable

