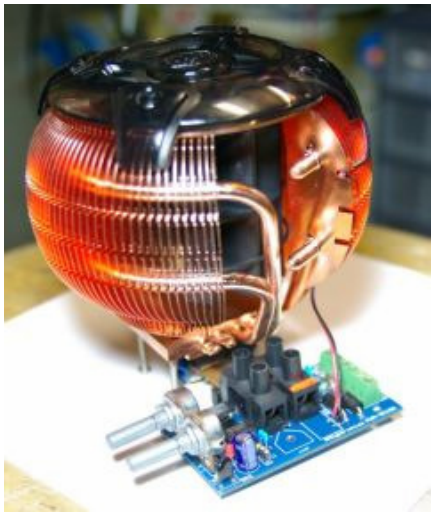
High Power Pulse Modulator

A Variable Square Pulse Generator



PWM–OC70A (modified version of PWM-OC10A)

This is a multifunction variable pulse generator. It is designed to fit a wide range of applications and be fully adjustable so that it can be used for many different tasks.

This has two separate open collector outputs for driving loads. One is a low power output of up to 1A (continuous), the other output is capable of switching 70A continuously from a source of up to 600V. The switching frequency is adjustable from below 1Hz up to 300kHz in ranges determined by the fitted timing capacitor.

The modules can be linked together in a master/slave setup, daisy chained, or linked with other products like the PWM-OC10A or SG-LCR2M.

This device utilises a large cooling device to ensure maximum switching efficiency

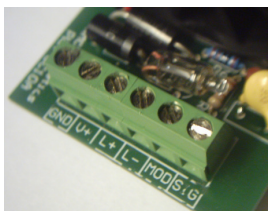
Features and Specifications

NB: Figures may vary under different loading conditions and environments.

Adjustable square wave output
Supply Voltage - 12V to 15V
Supply Current - up to 1.5A (no load)
Dual power output
Output B - 10A peak, 1A continuous.
Output A - 100A peak, 70A Continuous
Max Switching Voltage A - 600V
Max Switching Voltage B - 50V
High dV/dt (switching transition speed)

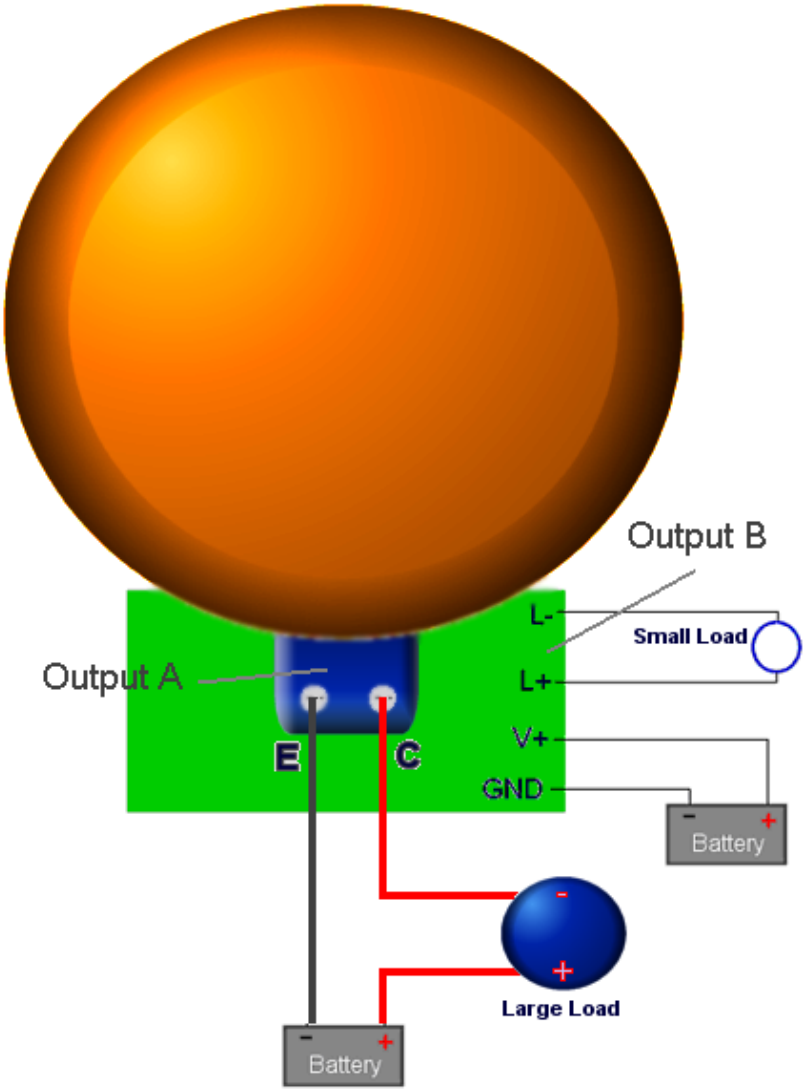
Independent frequency and pulse width / duty cycle controls
Frequency range - < 1Hz to 300kHz (adjustable range selected by inserting capacitor c1 (included))
Duty cycle (pulse width) - 0% to 100%
All copper heatsink with two heat pipes and central fan.
Back e.m.f / high voltage transient early warning indicator and protection (output B only)

Connections



Connections to the circuit are made using the 6 way terminal block at the end of the board and the large central terminal block. The input power is connected to ‘GND’ and ‘V+’ with a voltage from 12V to 15V. When using the high power output (A) it is recommended you use a separate power source so that any voltage drop does not slow down the cooling fan.

GND	Ground, Earth, 0V, or battery negative terminal.
V+	Input Voltage 12 to 15V, 10 amps MAX
E	Output A Emitter (connect to GND of your high current power supply)
C	Output A Collector (connects to –ve terminal of your load)
L+	Load B positive
L-	Load B negative
MOD	Modulation Voltage In/Out
SIG	Signal In / Out



Important Usage Notes

Always make sure the pulse width is set to minimum (pot turned fully anti-clockwise) before connecting the circuit to a load or power source. Use a fused power supply to protect from accidental short circuit or overload. The fuse should be rated to suit your application and up to a maximum of 10A. The heat generated in the switching transistor will vary with your loading conditions and the settings for frequency and pulse width. When driving high power loads, **always check the temperature of the heatsink** after making any adjustments.

Controls

The frequency and duty cycle can be independently adjusted using the potentiometers labelled VR1 and VR2. The frequency is adjusted with VR1 while the pulse width can be adjusted with VR2. The frequency **range** of the device depends upon the capacitor value of C1. The pre fitted capacitor is 200nF which gives a range of low frequency pulses which can be seen on the output LED (LED2). Replacing C1 with a smaller value capacitor will give a range of higher frequencies. At high frequencies LED2 will appear to have a brightness that is proportional to the pulse width setting. If the output frequency is adjusted above 300kHz the shape of the output waveform will become more distorted and more heating will occur in the switching device.

Jumper Settings – I/O connectors

The jumpers JP1 and JP2 are used to set the status of the 'MOD' and 'SIG' connectors. With the jumper links in place (default), the 'MOD' and 'SIG' can be used as outputs while removing the jumper links causes them to act as inputs. When set as inputs the onboard manual adjustment of the relevant controls is disabled.

The voltage ratings for the I/O ports are to be kept within the voltage of the supply to the V+ connector. A 100 ohm resistor is recommended for protection when connecting to external devices.

The jumper pins shown as JP1 can be used in a variety of ways for altering how the duty cycle is controlled. In its default position the pins are connected and duty control is done using the on board potentiometer. JP1 can also be replaced by a varying resistance source such as an LDR or potentiometer. In this configuration the output duty cycle will increase as resistance decreases. The pot VR2 can now be used to adjust the offset value. To control duty cycle with an external voltage the jumper JP1 is removed and the input voltage is applied to the 'MOD' connector.

The jumper JP2 is used to set the 'SIG' connector as an input or output. With JP2 connected the device will function from the onboard signal and 'SIG' can be used as an output. With JP2 removed the device will require an external signal to be applied to the 'SIG' connector.

LED Indicators

LED1 lights to indicate that power is present in the signal generation circuitry. This can also be used to indicate the overall health of your input power supply. If the LED dims when the PWM output is high, this indicates your power supply is struggling to provide enough current. This could mean a low battery or overloaded PSU.

LED2 lights when the switching transistor is on. It is brightest when no load is on the output. This can be useful for setting the unit to match a resonant frequency of an LC circuit. With the pulse width set to around 50%, the frequency can be adjusted until the brightest (parallel LC) or dimmest (series LC) spot is found.

Driving Inductive Loads

The units are fitted with surge and spike protection that is suitable for most loads **on output B**. When driving large inductive loads or high voltage coils, it may be necessary to add extra protection against voltage spikes The Neon indicator lamp DS1 can be used to gauge the amount of back e.m.f. being generated by a load on output B. If the light flashes or glows orange only a small amount, the onboard protection will be adequate. If you see the neon lamp flashing or glowing brightly, your load is generating an excessive amount of back voltage. Try reducing the pulse width or increasing the frequency. If this does not help you will need to absorb this excess energy using snubber circuit or the unit may become damaged.

Example Applications

Hydrogen Production (Electrolysis)
Simple control over reaction rates with PWM control. It can switch large currents for direct connection to electrodes or use of transformers with widely adjustable frequency for impedance matching and resonating systems.

Pulse Width modulation (PWM) Motor Speed Control
Pulse Width Modulation (PWM) is used to accurately control the speed of DC motors. The pulse frequency can be adjusted to match your motor for performance or reducing noise. The speed of the motor can be adjusted using the preset on the board, or it can be attached another variable voltage source such as the analogue output from a microcontrollers or similar device.

Dimming or Flashing of LED's and Light bulbs
This module can be used to smoothly dim lights or make them flash at regular intervals. The brightness is adjusted by a pulse width modulated signal which can be

SMA Wire Driver
The variable pulse generator can be used as an
adjustable current source for powering muscle wire
(Shape memory alloy SMA wire). By using a medium frequency setting, the PWM control can be used to adjust the average current flowing through the muscle wires giving precise control over the movement. At low frequencies muscle wire can be pulsed for repeated movements.

Hot Wire Cutting
Easily adjustable power source for passing current through wire for cutting materials like polystyrene and foam.

Variable Voltage Source
Setting the frequency quite high an placing a large capacitor between L+ and L- will allow the unit to be used as a variable voltage source. The voltage output will be proportional to the pulse width.

Tone Generator for small or large speakers
This circuit generates an adjustable square wave signal that is powerful enough to drive anything from piezoelectric sounders to large bass speakers. The frequency range can be adjusted between sub bass and ultrasonic levels.

Solenoid or Relay Pulsing
Simple variable rate on/off function for driving relays or moving solenoids with repeated strokes or adjustable power.

Coil Pulsing
Drive coils and electromagnets with regular current pulses of up to 100 Amps. Ideal for magnetic launchers and many other pulsed coil experiments. At higher pulse frequencies the PWM control can be used to adjust the average field strength of a coil or electromagnet.

See the PWM-OC10A datasheet for more info on linking units together