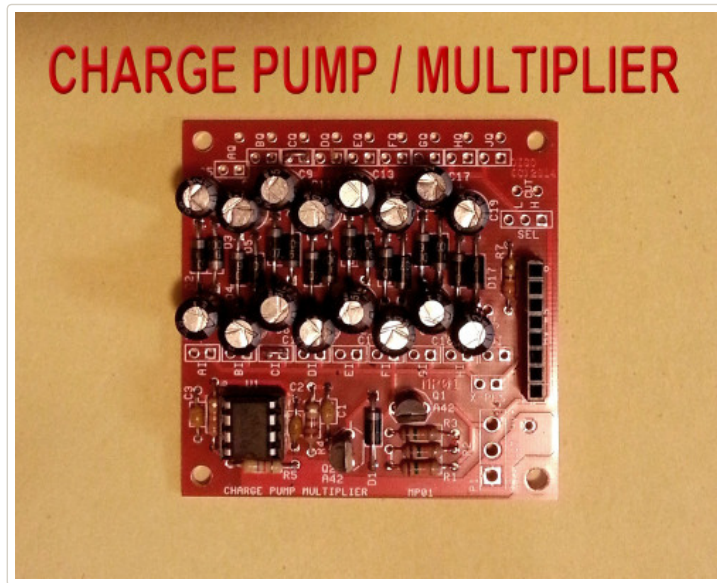


Threeneuron's Pile o'Poo

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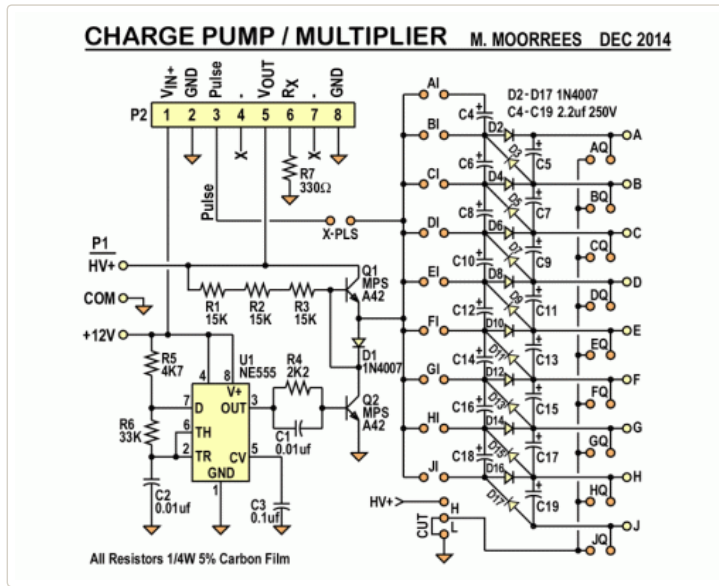
Charge Pump Multiplier Kit



This is convenient utility board for providing high voltages, if the current demand is low. It will take any voltage, upto 250V max, and multiply 8X positive or 8X negative, or combination of the two. It has a socket, which can accommodate my switching supplies, but can also boost a pre-existing positive voltage. Sold on [eBay](#).

Below is the schematic ([click to enlarge](#)):

CHARGE PUMP / MULTIPLIER M. MOORREES DEC 2014



On the board, there is a 555 based charge pump, that converts the incoming *HV+* DC, into a 2KHz squarewave of roughly 50% duty cycle. This means the high and low segments of the wave are roughly 250uS long, for each. A common 1N4007 has a reverse recovery spec of ~2uS, so it may only lose 1% of the energy, during switching. Fast or ultrafast rectifiers are needed if the 555 is switched at much higher frequencies. Those frequencies may be desired to reduce ripple.

Below is the parts list, of provided parts ([Click to enlarge](#)):

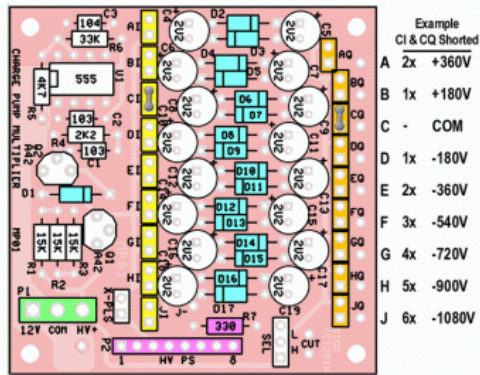
Ref Designator	Qty	Description	Mfr Part No.
<input type="checkbox"/> C1, C2	2	0.01uf, 50V, 20% Axial Ceramic	Generic 0.01uf Ceramic (103)
<input type="checkbox"/> C3	1	0.1uf, 25V, 20% Axial Ceramic	Generic 0.1uf Ceramic (104)
<input type="checkbox"/> C4 - C19	16	2.2uf, 250V AL Electrolytic	Panasonic ECA-2EM2R2
<input type="checkbox"/> R1, R2, R3	3	15K 1/4W, 5% Carbon Film	Generic 1/4W, 5% Carbon Film
<input type="checkbox"/> R4	1	2.2K, 1/4W, 5% Carbon Film (2K2)	Generic 1/4W, 5% Carbon Film
<input type="checkbox"/> R5	1	4.7K, 1/4W, 5% Carbon Film (4K7)	Generic 1/4W, 5% Carbon Film
<input type="checkbox"/> R6	1	33K, 1/4W, 5% Carbon Film	Generic 1/4W, 5% Carbon Film
<input type="checkbox"/> R7	1	330Ω, 1/4W, 5% Carbon Film	Generic 1/4W, 5% Carbon Film
<input type="checkbox"/> D1 - D17	17	400PRV 1A Rectifier	Generic 1N4004 - 1N4007
<input type="checkbox"/> Q1, Q2	2	300V NPN Transistor, TO-92	Generic MPSA42
<input type="checkbox"/> U1	1	Timer / Oscillator, 8-DIP	Generic NE555 DIP
<input type="checkbox"/> XU1	1	8-DIP IC Socket	Any
<input type="checkbox"/> P1	-	Input Pads	(solder pads only)
<input type="checkbox"/> P2	1	8-pin single row Skt 0.100"	Any
<input type="checkbox"/> PCB	1	MP01 bare PCB	Tortugascuba MP01

Suppliers: mouser.com, digkey.com

All parts are commonly found. Nothing is exotic. Simply assemble it, and set the jumpers for the desired output.

Here is the assembly drawing ([click to enlarge](#)):

Charge Pump Multiplier Assembly Guide



- Short one jumper from **group XI**, and one from **group XQ**, per table 1, to get desired voltages. CI and CQ shown, in example.
- Outputs are pads A thru J, located near jumpers AQ thru JQ, respectively.
- Input voltage at **P1: +12V, COM**, and **HV+** (if switcher not inserted in P2).
- Switching Supply (NS6A or NK01A) plugs into **P2**. R7 sets primary voltage to 180V. If not used, an external HV+ can be applied at P1.
- D1 thru D17** are 1N4007 rectifiers, provided with kit. Higher speed rectifiers can be used. Kit frequency is 2KHz, with parts provided. Frequency can be increased, to reduce ripple, if faster rectifiers, such as the UF4007 or BAV21 are used.

And Table 1, for setting the voltage multiplying factors ([click to enlarge](#)):

Jumpers Output	AI & AQ	BI & BQ	CI & CQ	DI & DQ	EI & EQ	FI & FQ	GI & GQ	HI & HQ	JI & JQ
A		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V	+6x +1080V	+7x +1260V	+8x +1440V
B	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V	+6x +1080V	+7x +1260V
C	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V	+6x +1080V
D	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V
E	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V
F	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V
G	-6x -1080V	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V
H	-7x -1260V	-6x -1080V	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V
J	-8x -1440V	-7x -1260V	-6x -1080V	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V	

- Always jumper in corresponding pairs (ie CI & CQ). Never mix jumpers.
- Output voltages shown for +180V at HV+. Actual output voltages will be 10 to 20% lower, unloaded. Greater reduction with load. For light loads only.
- Voltage at jumper location, XQ, will be 0V.

Its very important, that you select the jumpers, in corresponding pairs. If not, you will damage the board !

This board can come in handy for high voltage experiments, or to replace the burned up winding of an oscilloscope CRT. Most old scopes used a high negative voltage between -1000 to -1500V, which was applied to the cathode. That way the Ultor (anode 2), and deflection plates could be near a normal B+ voltage in the 200 to 250V range.

The incoming HV+, can come from either, one of my switching supplies (NK01A, or NS6A), or any DC voltage from 12V to +250V, applied to HV+. +12V, which can vary from +8V to +16V, is also needed to run the charge pump.

The [NK01A](#) and NS6A can be found at [eBay](#).

[Edit this entry.](#)

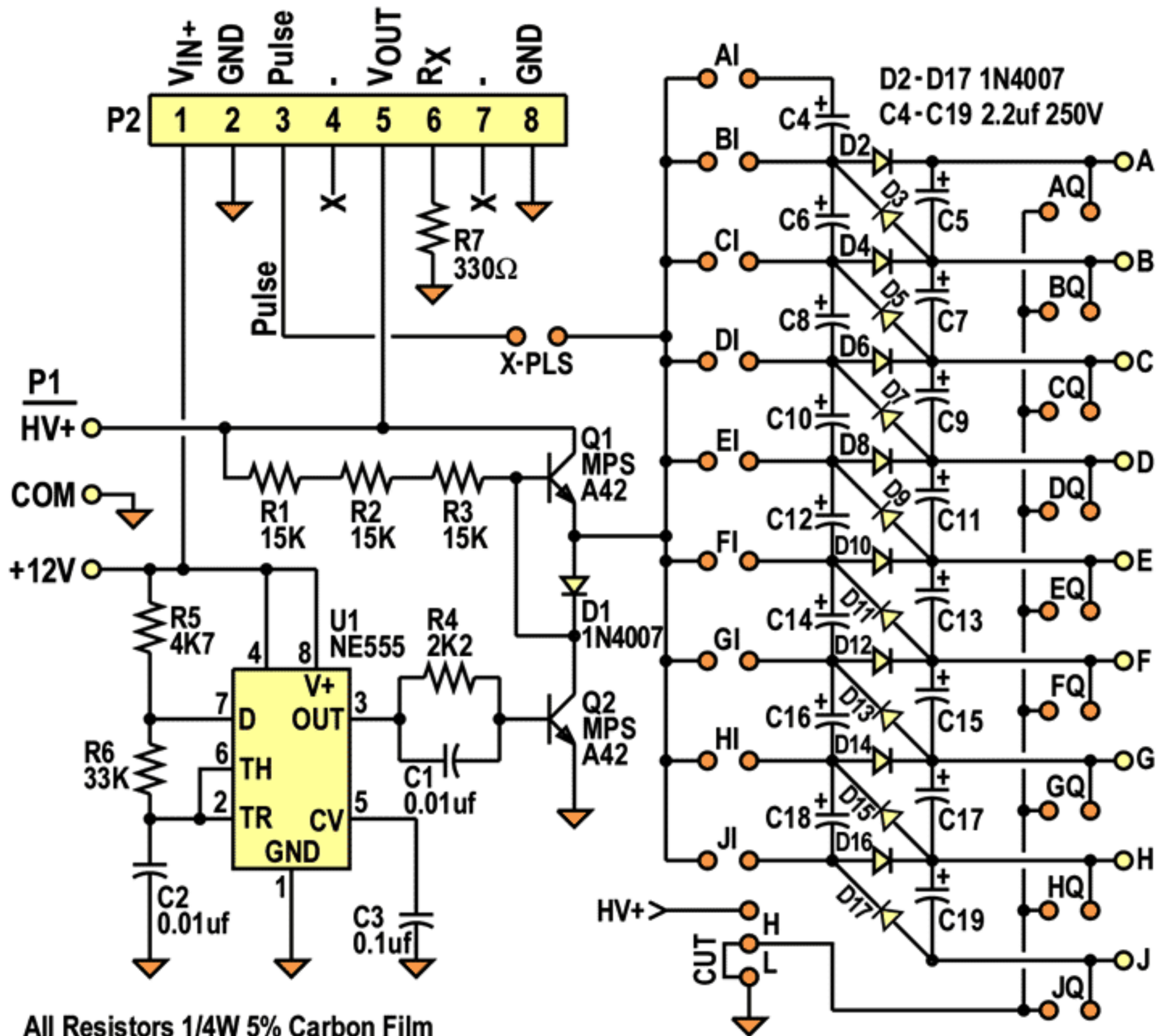
Blog at WordPress.com.

The Notepad






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CHARGE PUMP / MULTIPLIER

M. MOORREES DEC 2014

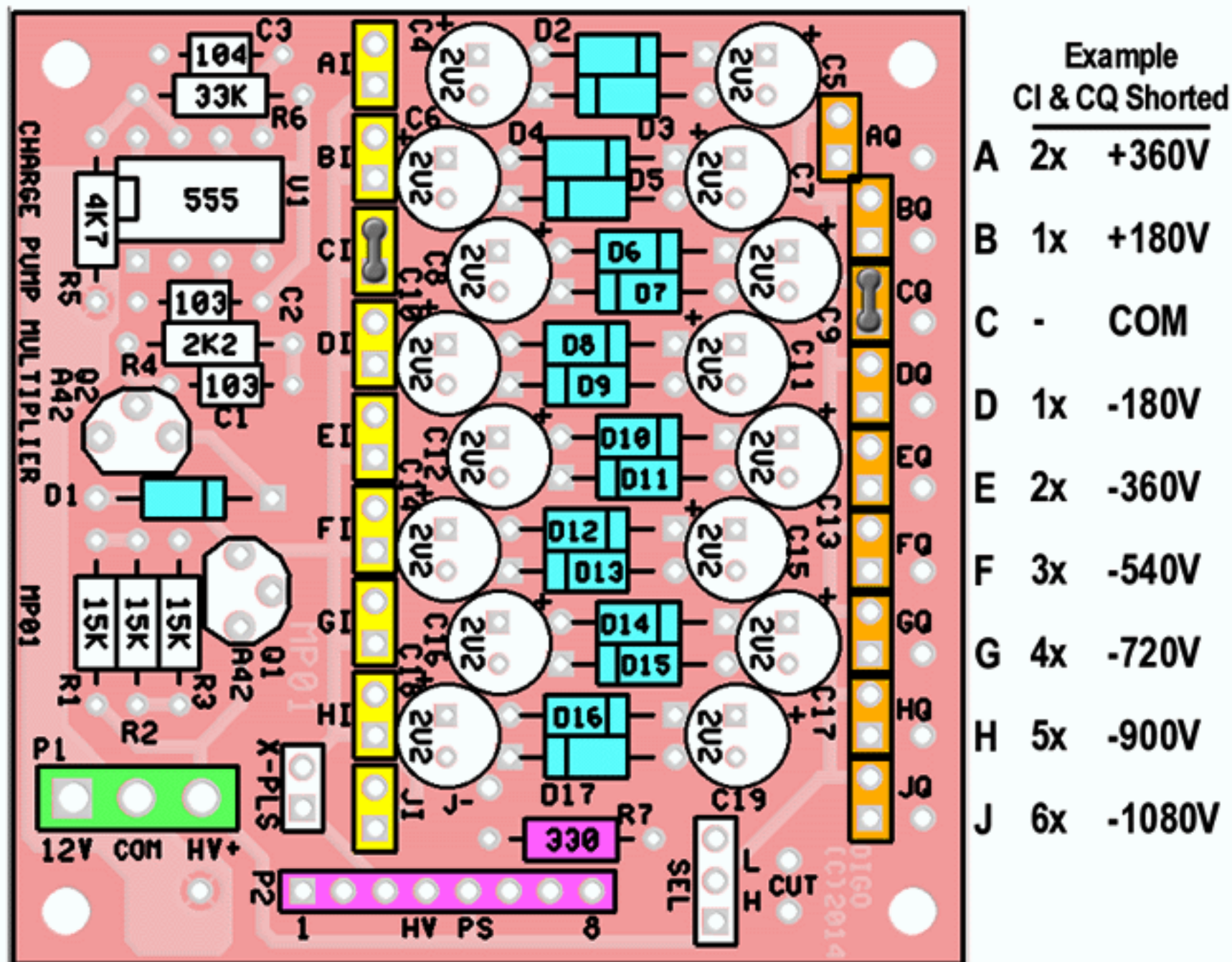


Bill of Materials:

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<input type="checkbox"/> PCB	1	MP01 bare PCB	Tortugascluba MP01










Suppliers: mouser.com, digikey.com

Charge Pump Multiplier Assembly Guide



1. Short one jumper from **group XI**, and one from **group XQ**, per table 1, to get desired voltages. CI and CQ shown, in example.
2. Outputs are pads A thru J, located near jumpers AQ thru JQ, respectively.
3. Input voltage at **P1: +12V, COM, and HV+** (if switcher not inserted in P2).
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Table 1 - Voltage Select Jumpering

Jumpers Output	AI & AQ	BI & BQ	CI & CQ	DI & DQ	EI & EQ	FI & FQ	GI & GQ	HI & HQ	JI & JQ
A		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V	+6x +1080V	+7x +1260V	+8x +1440V
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C	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V	+6x +1080V
D	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V	+5x +900V
E	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V	+4x +720V
F	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V	+3x +540V
G	-6x -1080V	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V	+2x +360V
H	-7x -1260V	-6x -1080V	-5x -900V	-4x -720V	-3x -540V	-2x -360V	-1x -180V		+1x +180V
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