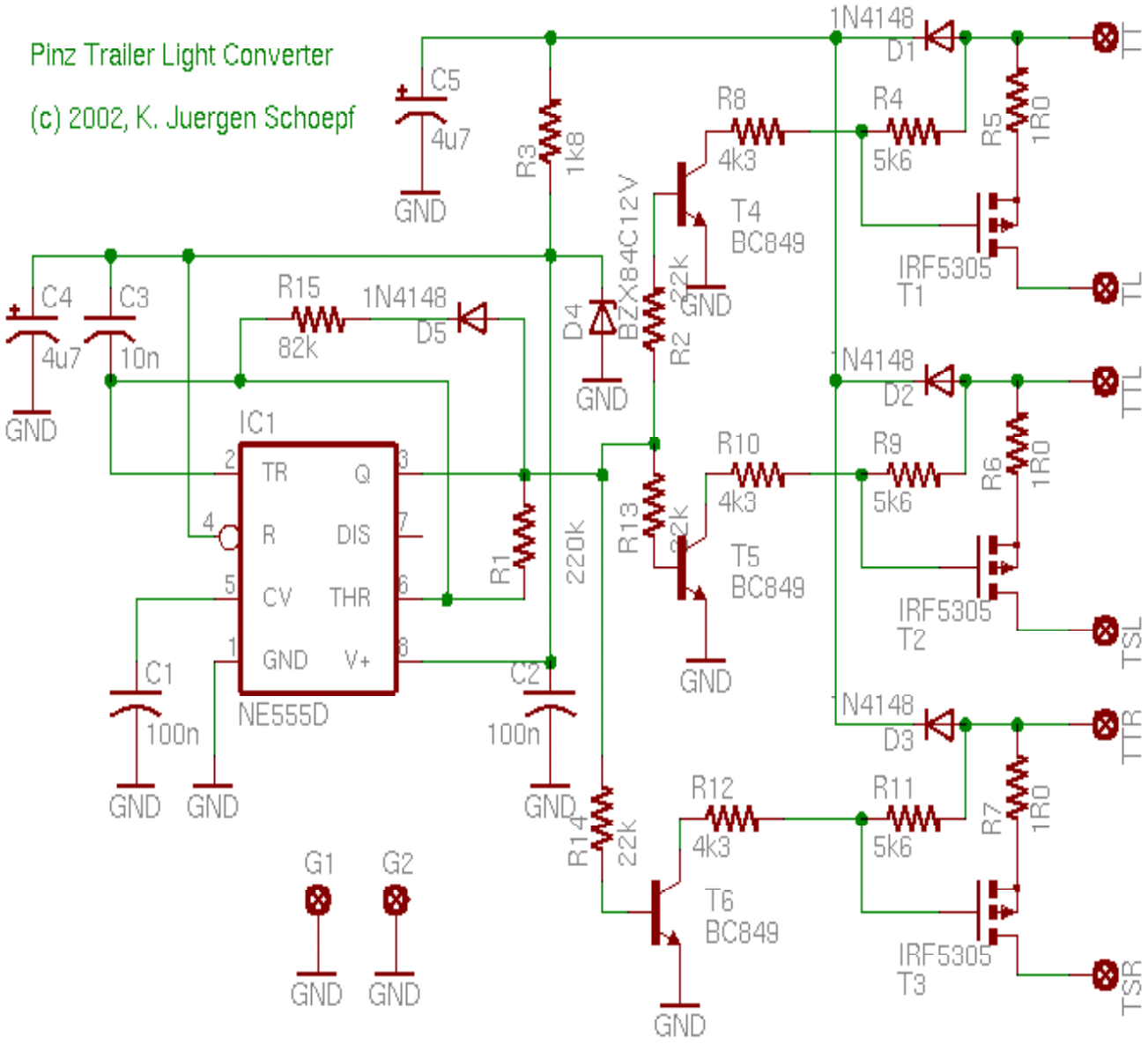
24V Pinzgauer Trailer Connector to 12V Trailer Light Converter

This converter only works with trucks which have brake and turn signal already combined. If your truck has separate pins for turn signal and brake DON'T use this converter. The converter is also not suited for trailers with 12V LED lights!!! If you connect a trailer with LED lights you WILL kill the LEDs immediately as the lights are usually of lousy design! It also doesn't work with 3-bulb (European style) trailer lights.
The converter uses a simple trick. The signals are simply chopped at ~500Hz with a 1:3 duty cycle. The resulting average power is half of the input voltage or exactly what you need for your 12V bulbs.

Schematic:

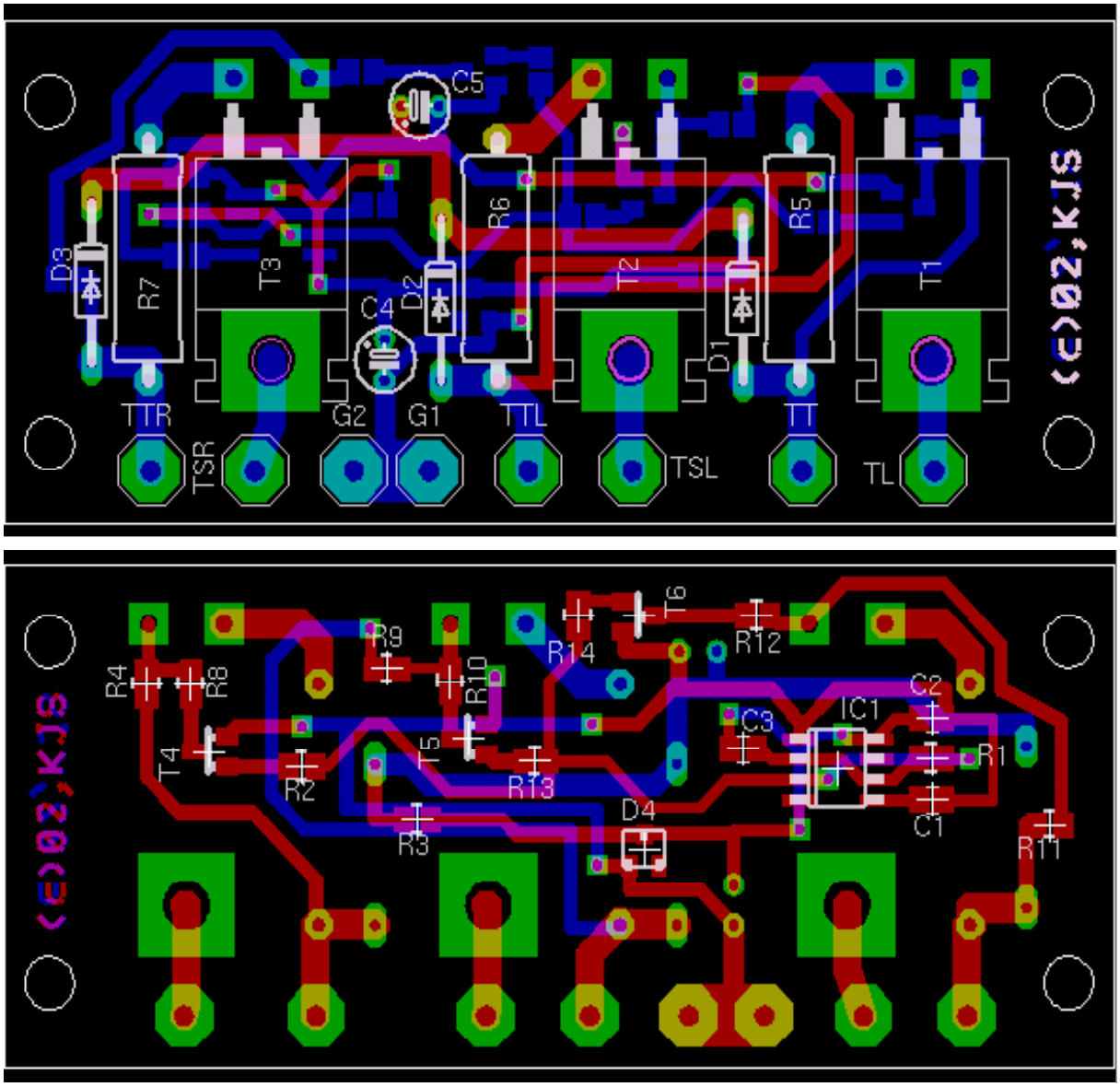


Parts List:

IC1: NE555D, preferably the CMOS version
T1 -T3: IRF5305
T4 - T6: BC849 or FMMT3904CT
D1-3, 5: 1N4148 or any other silicon diode
D4: BZX84C12V, SOT23 or any other 12V zener diode in SOT23

C1, 2: 100nF ceramic, 0805
C3: 10nF, 0805, preferably foil but ceramic works too
C4, 5: 4.7uF to 10uF/35V (better 50V!)
R1: 220k, 0805
R2, 13, 14: 22k, 0805
R3: 1k8, 0805
R4, 9, 11: 5k6, 0805
R5-R7: 1.0R, 2W
R8, 10, 12: 4k3, 0805
R15: 82k 1/16W leaded
Waterproof cast Aluminum box: Hammond 1590WA
Original Pinz trailer plug
Whatever plug you want for the 12V trailer (you can have 2 different ones. I have a 6-pin round and a 4-pin flat on a wire).

Printed Circuit board:



Construction:

The best way to "install" the converter is to machine a hole large enough for the end of the Pinz plug into one side of the aluminum box. If you want to have a 6 or 7-pin trailer connector machine another hole on the opposite side of the box. Solder wires to the connectors (4 for the Pinz side, 4 for the trailer side), cover the solder joint and a bit of the wire with 3M 5200 marine adhesive and epoxy the plug (and trailer socket) into the box. Make sure you drilled the 4 holes for the PCB into the bottom of the box before you glue!

Assemble the PCB according to the schematic, solder the wires from the plug and socket to the appropriate pins of the board and bolt the PCB into the box. Make sure the PCB doesn't touch the box! A few nuts on the bolts will keep it high enough. If you cover the first nut + screw with 3M it's also watertight there.
D5 and R15 have to be assembled on the bottom side of the board between the via at R1 and C3. This was a fix I had to implement after the PCB was made, sorry!
Attention! R15 and D5 have to be assembled on the bottom side of the board between the via at R1 and C3. They were fixed added after the PCB was designed, sorry!
Remark: The center pin of the power FETs has to be cut. This circuit uses the heatsink as the drain connection. Make sure the FET's are well attached to the board with bolts (Caution: T3 needs an insulator between the heatsink and the board to avoid possible shorts to the vias!!!!). If you want to make sure that parts don't rattle loose cover them with 3M?? It is best to solder the screw heads to the board from the bottom side and have the nuts with lock washers on top. If you put a bit of 3M over the nut/washer you will prevent problems due to corrosion?..

The complete set of components is available from www.digikey.com.

Again: NEVER use it with LED lights on a trailer!!!!!!!!!!!

Board Connections:

TT: tail light pin of the Pinz plug
TL: tail light pin of the 12V trailer connector
TTL: left brake/turn signal pin of the Pinz plug
TSL: left brake/turn signal pin of the 12V trailer connector
TTR: right brake/turn signal pin of the Pinz plug
TSR: right brake/turn signal pin of the 12V trailer connector

Legal:

This circuit is purely experimental and you use it at your own risk. It is by no means approved or compliant with any set standards and by building the circuit you acknowledge that you were advised to not use it on public roads. The compliance with local laws has to be checked by the builder prior to the first use of the described circuit.
You are allowed to use this information for your own application. Distribution of this design is only allowed if you distribute the entire information. Commercial use is strictly prohibited without prior written approval!

Printed circuit boards can be made available, please email kjshover@hotmail.com with your inquiry.

N.B. I have designed but not tested a similar circuit for European style trucks (like the Unimog). If you are interested please let me know?.