PCB Designing of Single Phase Full Bridge Inverter

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(Self-project)

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Introduction:

Single Phase Full Bridge Inverter is basically a voltage source inverter. Unlike Single Phase Half Bridge Inverter, this inverter does not require three wire DC input supply. Rather, two wire DC input power source suffices the requirement. The output frequency can be controlled by controlling the turn ON and turn OFF time of MOSFET.

The output or load voltage can be resolved into Fourier series:

$$V_0 = \sum_{n=1,3,5.....}^{\infty} \frac{4V_s}{(n\pi)} sinn\omega t$$

Design of snubber circuit:

Snubber circuits provide protection against transient voltages that occur during turn-off. Generally, a simple RC snubber uses a resistor R in series with a capacitor C. The RC snubber is connected in parallel with a power MOSFET. Cutting off a current in a circuit causes its voltage to increase sharply due to stray inductances. The snubber damps this surge voltage to protect the power MOSFET as well as components in its vicinity.

The value of capacitance:

$$\boldsymbol{C = I_{load\ current} * \frac{T_{off}}{V_{DC}}}$$

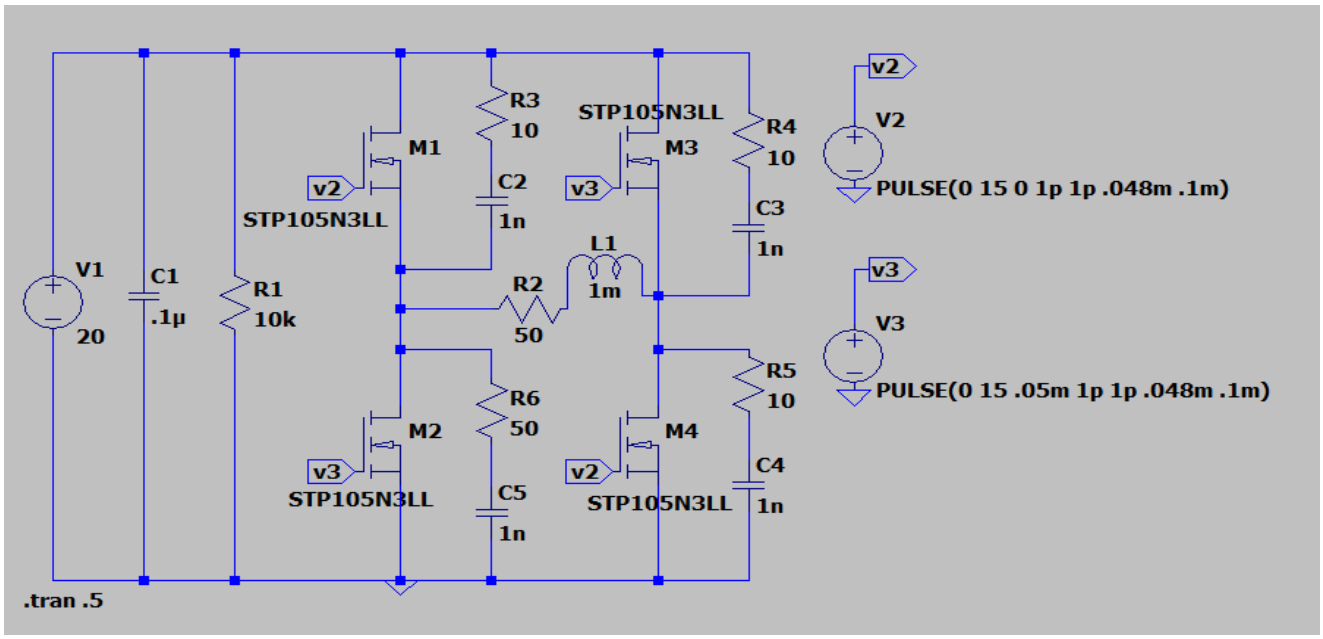
The value of Resistance:

$$\boldsymbol{I_{(load\ max)} + \frac{V_{DC}}{R} < I_{peak\ cap\ device}}$$

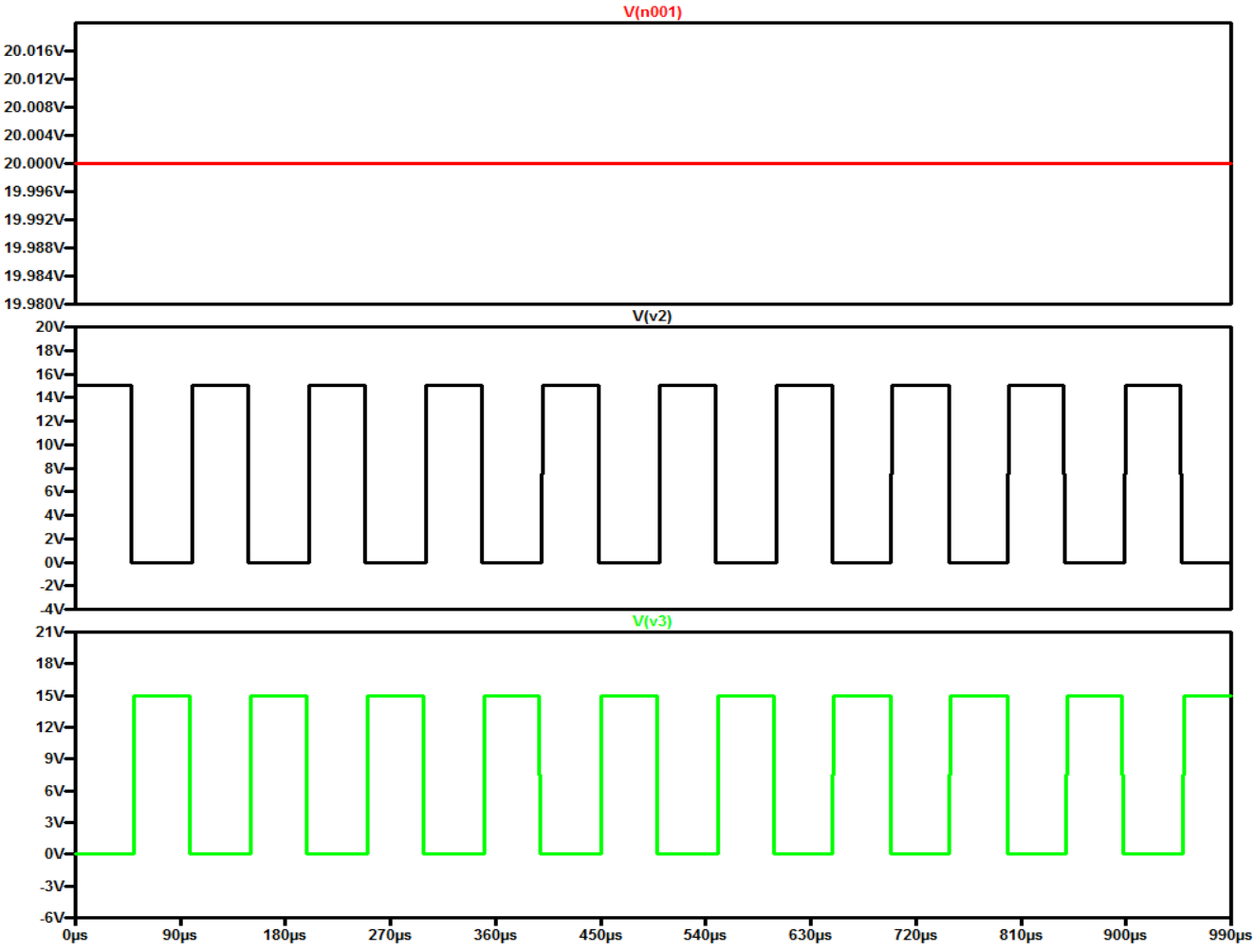
$$\boldsymbol{R > \frac{V_{DC}}{I_{peak\ cap\ device} - I_{load\ max}}}$$

Use of component:	**Specification**
MOSFET: STP105N3LL	MOSFET N-Ch 30V 2.7mOhm 150A STripFET VI
Gate driver IC: HCPL3120	2.5A Gate Driver Optical Coupling 3750Vrms 1 Channel 8-DIP Gull Wing
Snubber-resistance: ERJP06J100V	10 Ohms ±5% 0.5W, 1/2W Chip Resistor 0805 (2012 Metric) AutomotiveAEC-Q200, Pulse Withstanding Thick Film
Snubber-Capacitance C1206C104K5RACTU	0.1 µF ±10% 50V Ceramic Capacitor X7R 1206 (3216 Metric)
Film capacitor: B32672L8102	1000 pF Film Capacitor 700V 2000V (2kV) Polypropylene (PP), Metallized radial
Wire wound resistor: HS25KJ	Chassis mount 25W 1000 Ohms 5%
TWO PIN: 1715721	

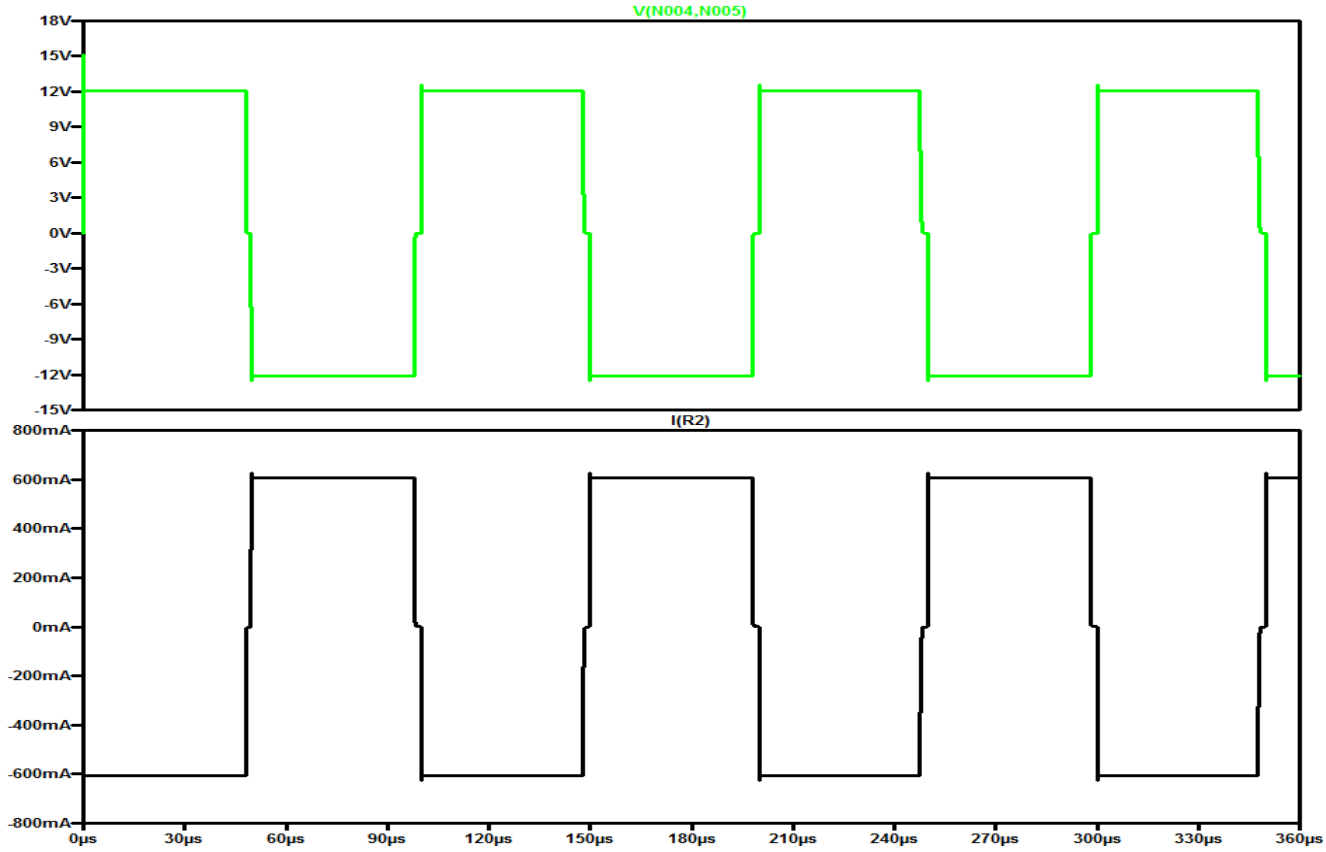
Simulation model of LT Spice:



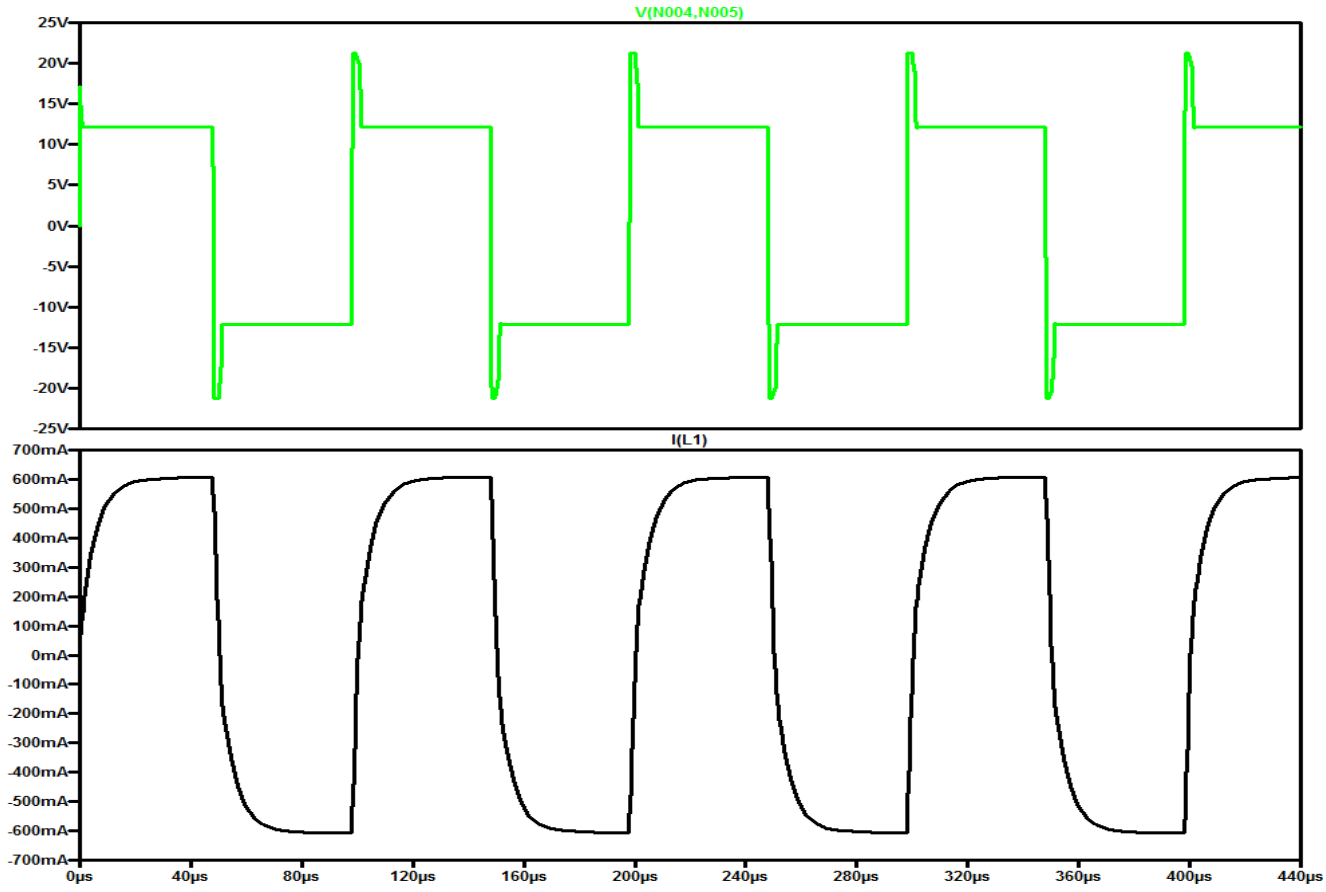
Simulation Waveform (Input voltage and MOSFET switching)



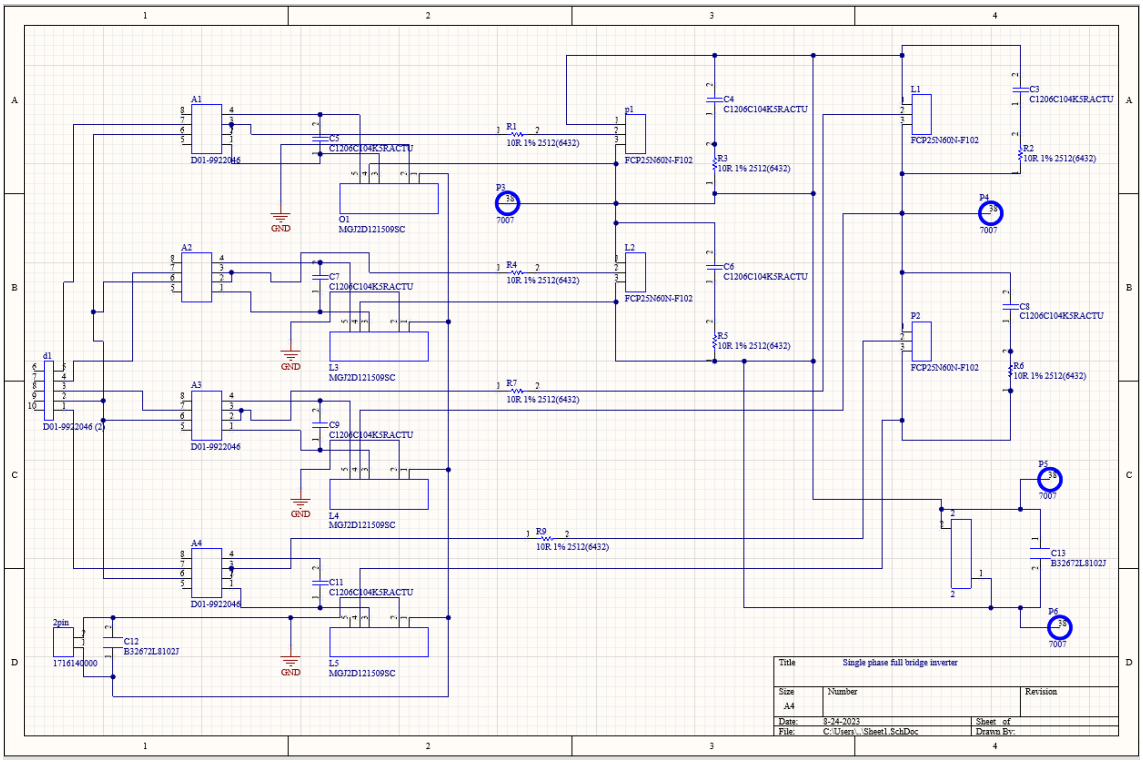
Simulation Waveform (output Voltage and output current for R load)

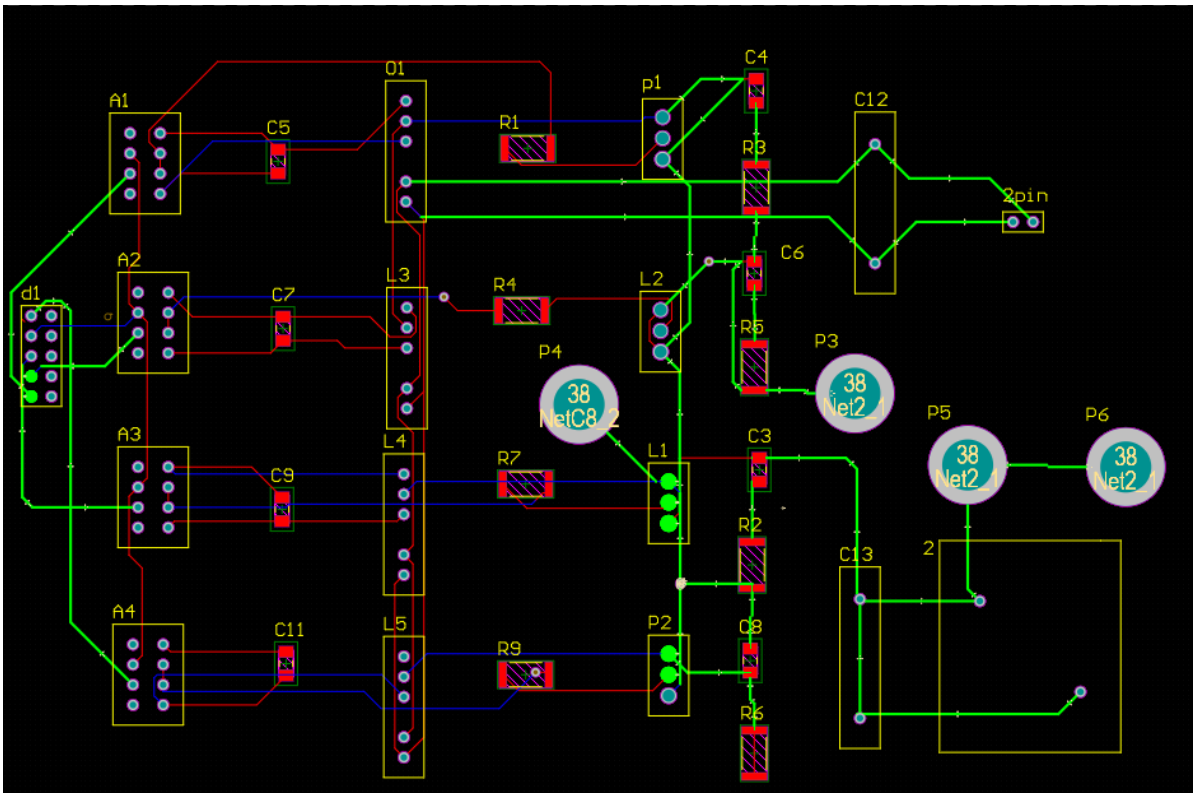


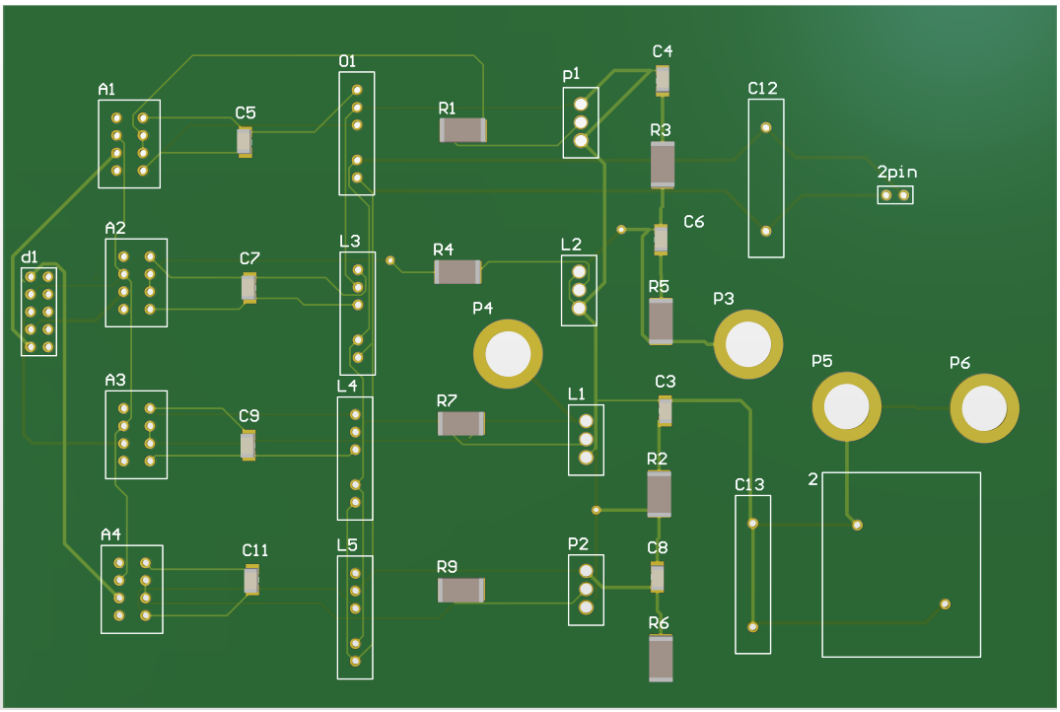
Simulation Waveform (output Voltage and output current for R-L load)



PCB schematic circuit diagram;







Conclusion:

Single phase full bridge inverter circuit is simulated in LTspice software and results are shown. A PCB is designed for Single Phase Full Bridge Inverter in Altium software. Gate driver HPCL3120 is considered for giving switching pulses to the MOSFET.