50 MHz GaN Based Power Amplifier with Digital Resonant Gate Drive

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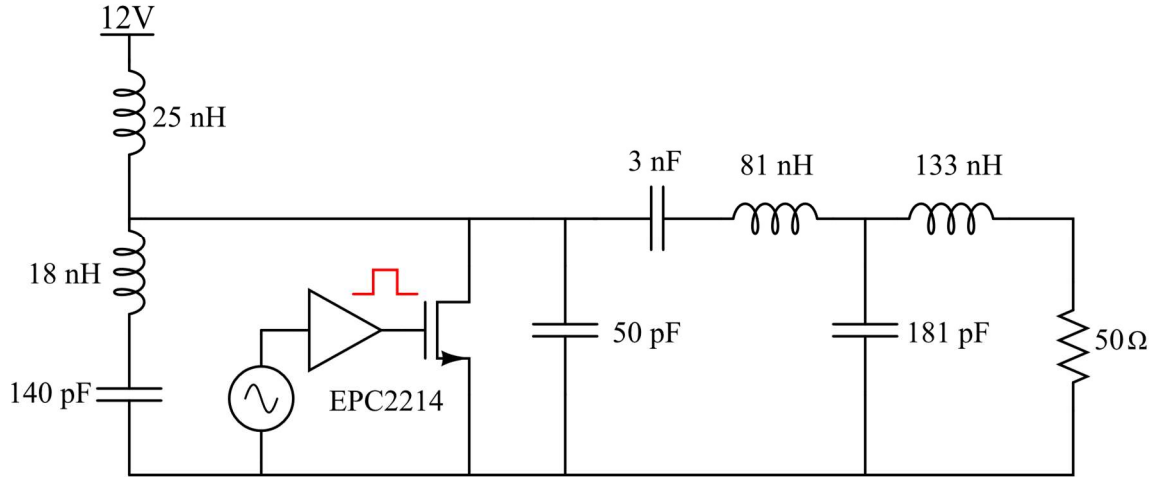
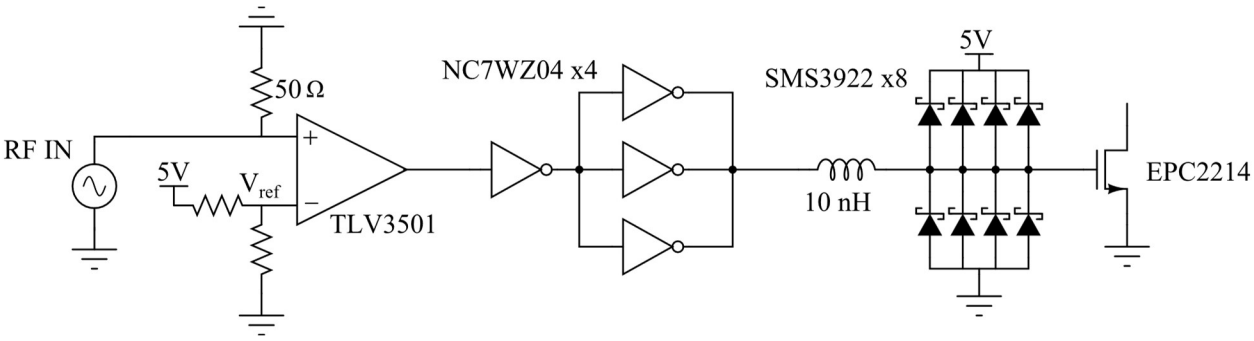
Abstract

We present a 50 MHz power amplifier capable of delivering 11 W CW using a GaN transistor in a class Φ_2 design. To drive the GaN device, we utilize a resonant gate drive with digital inverters, an auxiliary inductor, and freewheeling diodes to minimize gate loss.

Schematic: Primary Power Stage



Schematic: Resonant Gate Drive



Parts List

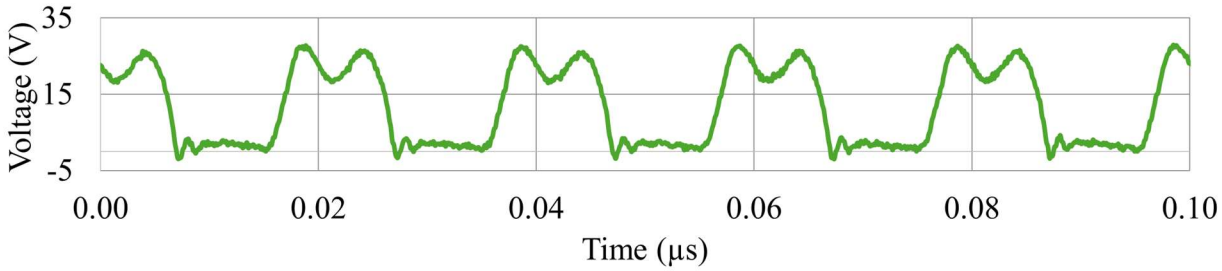
Part Number	Description	Quantity
EPC2214	80 V 47 A GaN Transistor	1
TPS563203	12V to 5V Buck Converter IC	1

NC7WZ04	Digital Buffer Inverter IC	4
TLV3501	Comparator IC	1
SMS3922	50 mA RF Schottky Diode	8
Capacitors	Ceramic, 0603, 0805, 1206, Electrolytic	28
Inductors	Coilcraft, Handwound	6
Resistors	0402, 0603	7

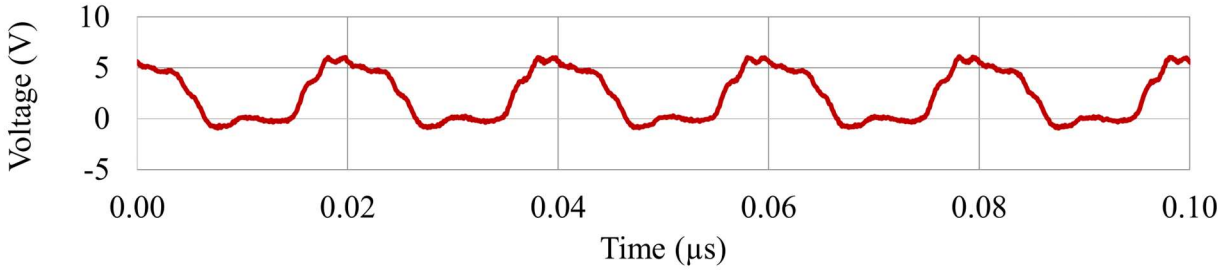
Constructed Circuit

Measurement Waveforms:

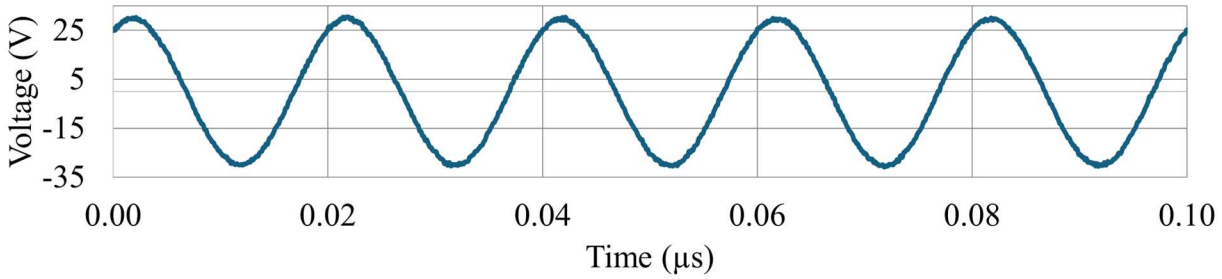
Drain voltage



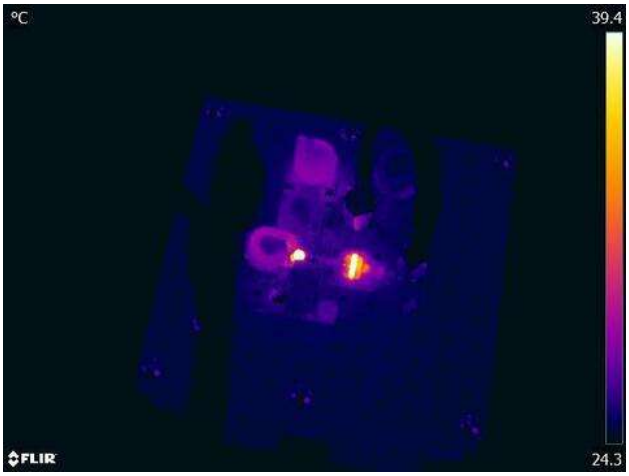
Gate Voltage



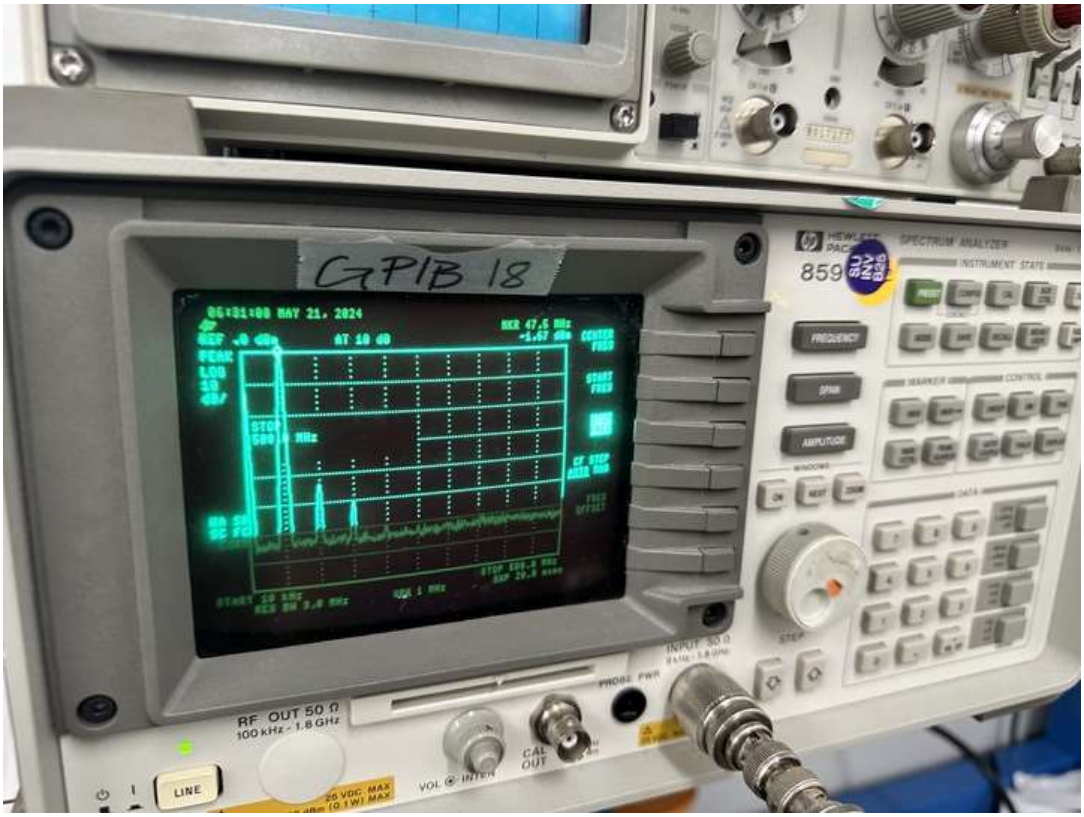
Output Voltage



Thermal:



Spectrum Analysis: About -42 dBc



Total Efficiency: 81% @ 10.5 W