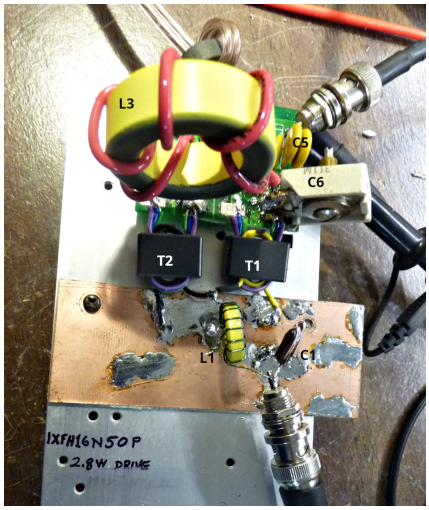
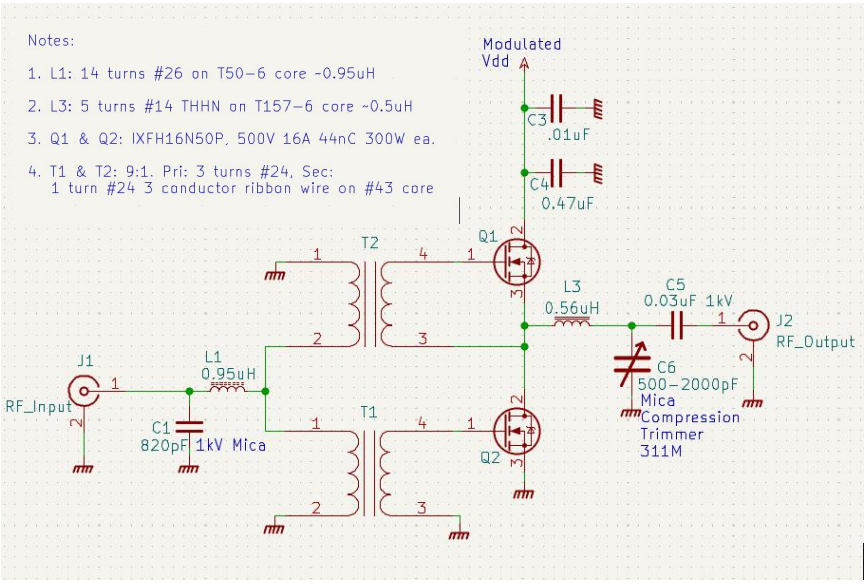
A Half-Bridge Class D PA for 40 meters

WO1U Mike 3-8-2024

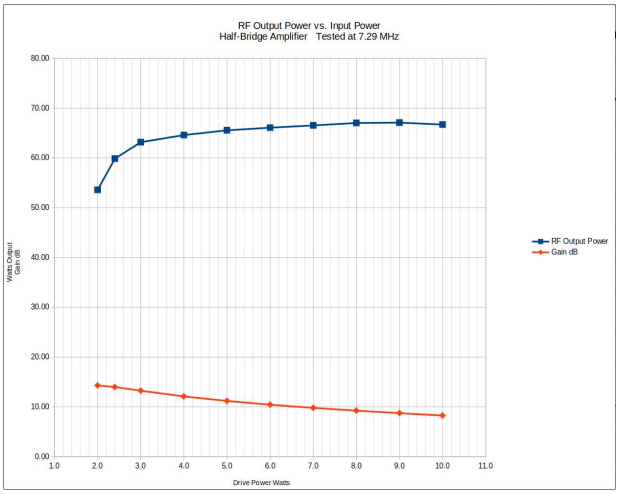
Here is a transformer driven Class D half-bridge amplifier. It can hit >80% efficiency. The fact that a Voltage Mode Class D amp can work efficiently on 40 meters is a testament to why I continue to use the IXFH16N50P mosfets. The PC board shown is chopped up from a full-bridge board I did >10 years ago.

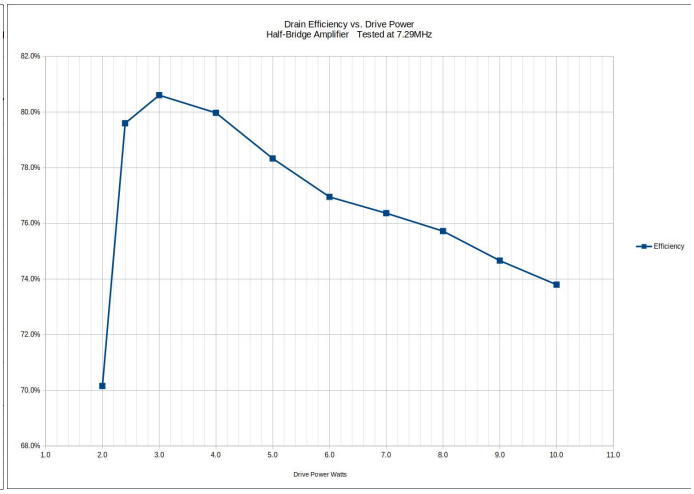




Test Data:

Test Conditions, except as noted otherwise: Vdd = 60.2V, F = 7.29MHz, Load = 50 ohms, Input VSWR = 1.1:1





Note the gate-side secondary winding of the input transformers is 3 conductors 24 AWG ribbon cable. Lowest practical DC resistance and / or inductive reactance is needed in the gate circuits. Brass tube and ferrite sleeve type transformers, such as the CCI RF-400 is preferred for that reason, but in absence of those, the above transformer design is as close to the same performance as RF-400s (9:1 #43) as I have been able to hand-make. Cores are Fair-Rite part number 2843010402.

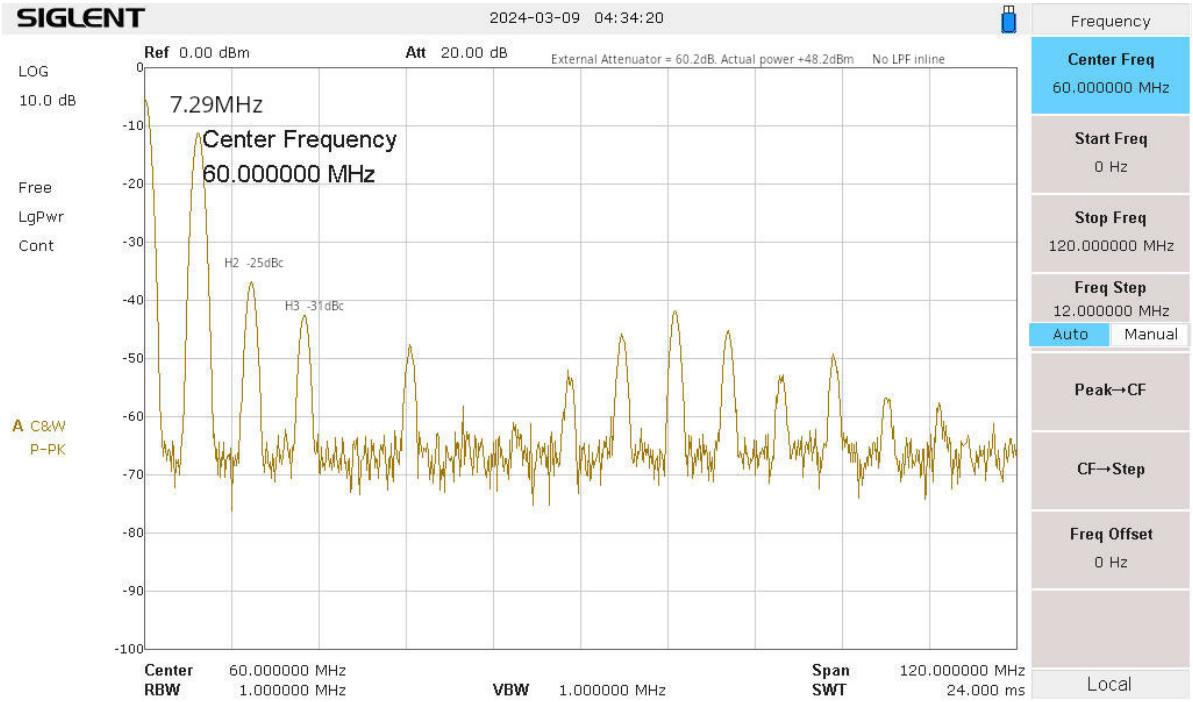
A Half-Bridge Class D PA for 40 meters

WO1U Mike 3-8-2024

Output Spectrum:

On a scope, the waveform looks reasonably sinusoidal. Spurs and harmonics are surprisingly manageable for a saturated switching amplifier. Adding a 5 element LPF reduces all spurs and harmonics to better than -50dBc.

(LPF = Series 2.3uH, 470pF to ground, series 3.2uH, 470pF to ground, series 2.3uH provides 7.4MHz cutoff.)



One final note about output power. With the appropriate heat sink, power can be scaled up with higher Vdd. A Half-Bridge with these devices should easily support AM operation up to about 200W carrier in real world operating. At Vdd = 110Vdc, output is 211W carrier. Other L3 & C6 values could accommodate higher Vdd without exceeding the output device specifications.

Half-Bridge RF Amplifier Testing
WO1U
03/05/24
L3 = 0.56uH

Modulation Z	Vdd	Idd	V_RF (RMS)	P_DC	RF Output Power	Efficiency	Drive_Power	Gain dB	Watts Loss
48.3	60.76	1.257	51.76	76.38	53.58	70.2%	2.0	14.3	22.8
49.1	60.75	1.238	54.71	75.21	59.86	79.6%	2.4	14.0	15.3
47.1	60.75	1.290	56.20	78.37	63.17	80.6%	3.0	13.2	15.2
45.7	60.73	1.330	56.83	80.77	64.59	80.0%	4.0	12.1	16.2
44.1	60.73	1.378	57.25	83.69	65.55	78.3%	5.0	11.2	18.1
42.9	60.73	1.414	57.48	85.87	66.08	77.0%	6.0	10.4	19.8
42.3	60.72	1.435	57.68	87.13	66.54	76.4%	7.0	9.8	20.6
41.6	60.71	1.458	57.89	88.52	67.03	75.7%	8.0	9.2	21.5
41.0	60.72	1.480	57.92	89.87	67.09	74.7%	9.0	8.7	22.8
40.7	60.66	1.490	57.75	90.38	66.70	73.8%	10.0	8.2	23.7

I hope someone finds this useful! 73, Mike