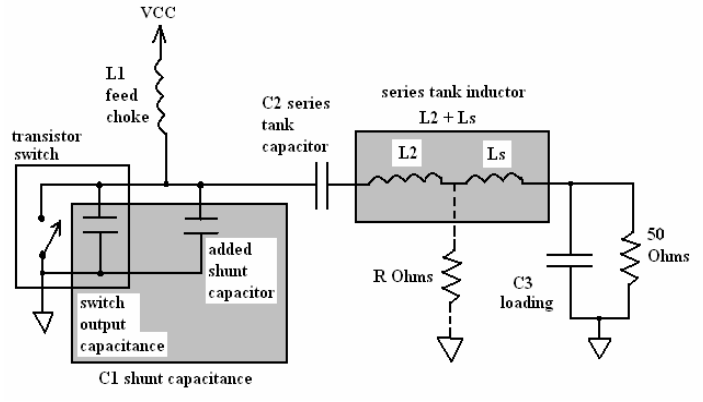
Class E PA Design - Enhanced. T.O. Bohlander WA3KLR 08/05/05.
file: ClassE_PA_design4c
Reference: *Class-E RF Power Amplifiers,*
by N. Sokal WA1HQC, QEX Jan/Feb 2001.
Modified by S.D. Personick AB2EZ 08/18/05



INPUT DATA:

	Enter	
Circuit Q =	15	
Frequency =	3.86	**MHz.**
VCC =	46	**VDC**
drain breakdown voltage =	900	**VDC**
transistor saturation voltage =	2	**VDC**
desired r.f. output power =	500	**Watts**
expected PA efficiency =	90	%
Step-up Transformer Turns Ratio, N =	**2**	**: 1**
L1 or L(m) reactance factor* =	100	**x R**

RESULTS:

			This result is a function of:	
DC Input Power =	**555.6**	**Watts**	rf output power, PA efficiency	
DC current =	**12.077**	**Amps**	VCC, dc input power	interim C1 4097
				interim C2 383
peak Vdrain =	**164**	**VDC**	VCC	
drain BV safety factor =	**0.18**		drain brkdwn volt., pk. Vdrain	**L Matching network:**
				Enter
R =	**1.949**	**Ohms**	Q, F, Vcc, sat. V., dc in pwr	Low Z = 7.798 **Ohms**
				High Z = 50.00 **Ohms**
DC feed impedance ~	**3.8**	**Ohms**	VCC, DC current	
				Q = **2.326358**
DC feed choke L1 =	**8.04**	**uH**	Freq., L1 reactance factor, R	**Xs =** **18.14** **Ohms**
				*** Ls =** **0.748** **uH**
shunt C1 =	**4224**	**pF**	Q, Freq., R, L1	**Cs =** **2272.9** **pF**
series tank C2 =	**372**	**pF**	Q, Freq., R, L1	**Xp =** **21.49** **Ohms**
				*** Cp =** **1918** **pF**
series tank L2 =	**4.823**	**uH ***	Q, Freq., R	**Lp =** **0.886** **uH**
*** Ls + L2 =**	**5.571**	**uH**	**For 50 Ohm Output**	
shunt "loading" C3 =	**1918**	**pF**		
The Q of component: L2 + Ls must be >	**300**			

Notes:
Circuit Q must be greater than or equal to 1.79. Practical values should be between 3 - 15 and more ideally between 4 and 10.

*If an output transformer is used, one does not require L1's reactance (in Ohms) to be large compared to R.
One does, however require a bypass capacitor to provide an RF ground at the point where L1 attaches to the primary of the transformer.
In the formula, L1 is replaced by L(m), where L(m) is the parallel "magnetizing" inductance of the primary of the transformer.

The Q of **component L2 + Ls** should be as high as possible.

This would be a Q of more than: 2 x (the Q of the output circuit)/(1- the target efficiency of the PA), if the actual target efficiency is going to be achieved; and assuming that no more than 50% of the power loss that limits the efficiency is associated with this inductor.

VCC is the supply voltage at maximum positive modulation.

Transistor saturation voltage - a number between 0 and 5 Volts typically. Enter 0 for ideal studies.

Expected PA efficiency is a number between 1 and 100. Example: For 93.3 % eff., enter "93.3" .

L1 is computed by multiplying "R" x "factor value". Practical factor value range is from 4 to 160.
Note: The capacitive reactance of C1 is usually about 4.5 x R.

The drain BV safety factor should be 0.8 or lower.

The calculated values for C1 and C2 compensate for the value of L1 feed choke.

The spreadsheet value **shunt C1** is the total combined capacitance of PA transistor effective output capacitance plus an additional shunt capacitor component.
So "component" C1 = (**shunt C1**) - (transistor effective output capacitance).

An L-C matching network is incorporated with (Ls + L2) and C3 to raise the 'R' output impedance of the tank circuit up to 50 Ohms output.