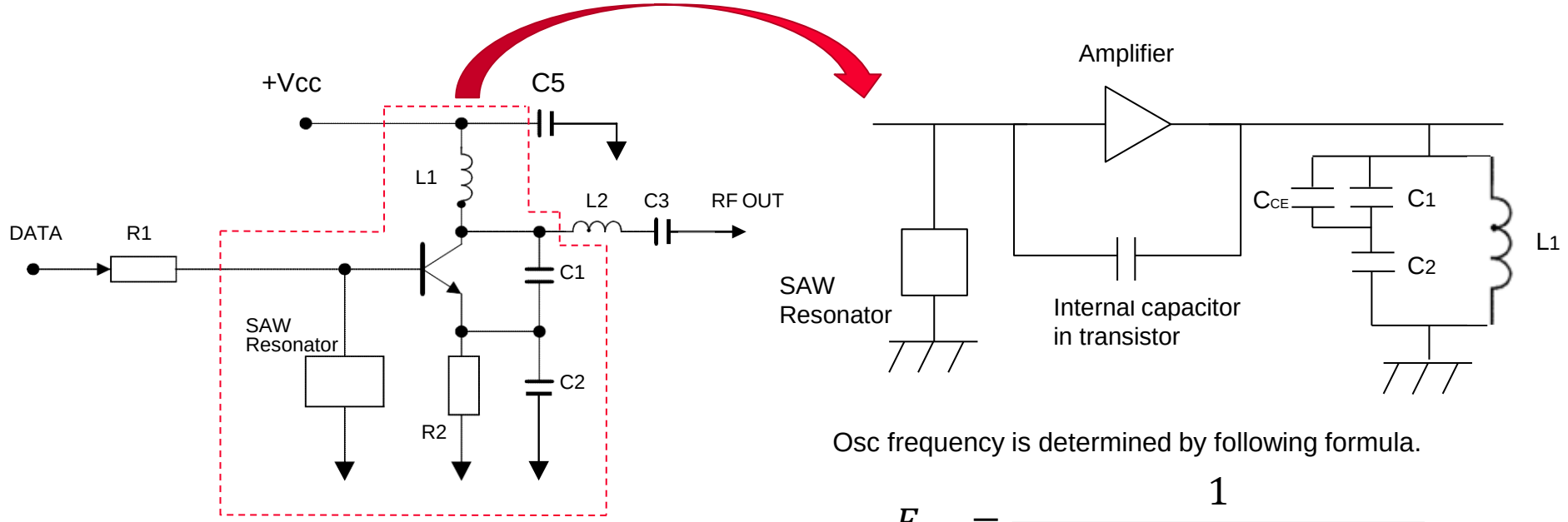
SAW based Transmitter design notes

- Recommended Schematic
- Oscillation Circuit Tuning
- PCB layout example
- Example of components value to start with

Recommended Schematic

Below is the recommended schematic and the equivalent oscillation circuit.
OSC frequency is defined by SAW resonator and LC circuit.



Osc frequency is determined by following formula.

$$F_{osc} = \frac{1}{2\pi\sqrt{L_1 \cdot \frac{(C_1 + C_{CE}) \cdot C_2}{(C_1 + C_{CE}) + C_2}}}$$

*The values need to be optimized in actual board circuit.
*C_{CE} is CE junction capacitance of the transistor.
Its value is vanishingly small in the current transistor,
but it needs to be taken in to account in the traditional one.

Oscillation Circuit Tuning

How to confirm the frequency variation in oscillate circuit ?

Replace the SAW with 56pF chip capacitor, and check the “free run” OSC frequency F0. The target is tune the F0 within Fc +- 5MHz. For example if the Fc=434MHz, try to tune the F0 within 429MHz to 439MHz.

How to optimize the matching in oscillate circuit ?

If the F0 is out of Fc +-5MHz, need to tune the value of C1, C2 and L1.
If the F0 is higher, increase the value; otherwise reduce the value of the components, until the F0 within +-5MHz of Fc. Then put the SAW back.

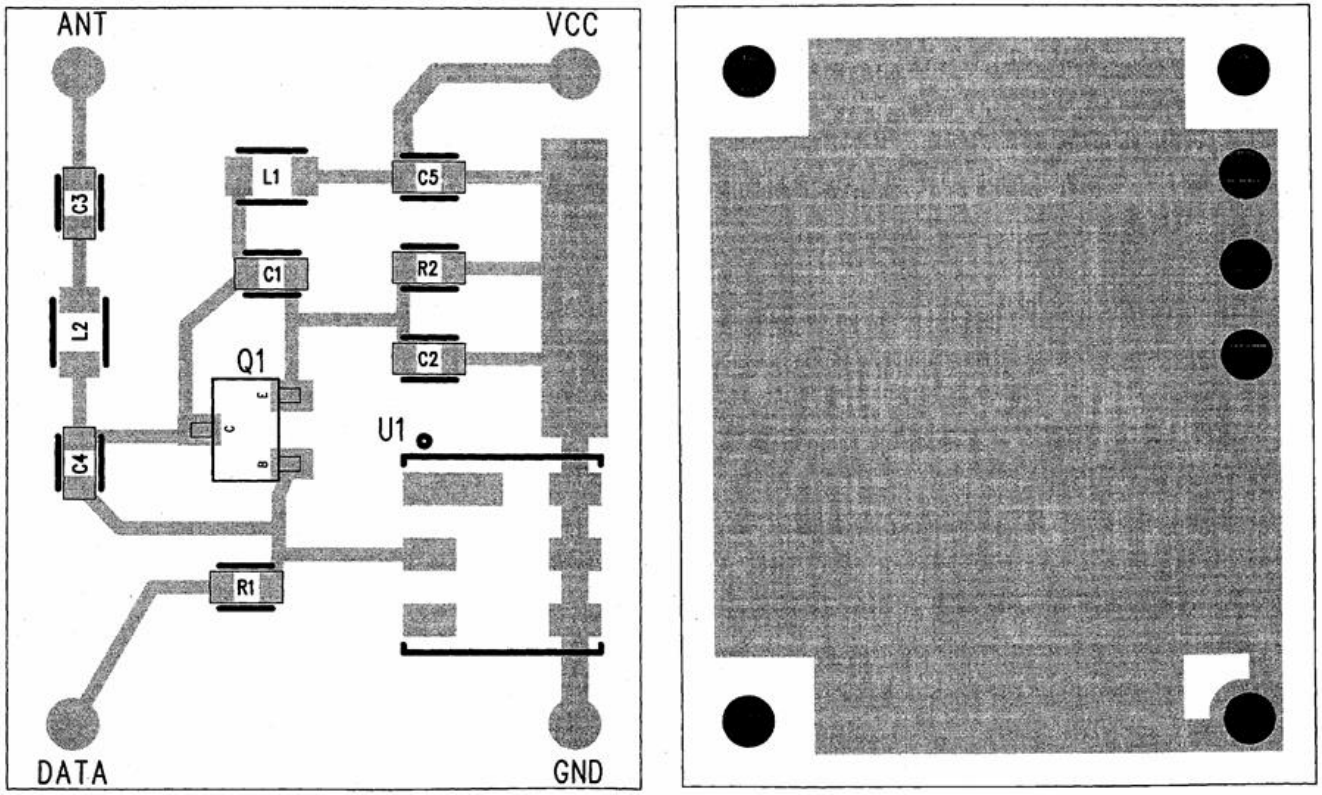
Note:

- The tuning should be done in room temperature, and keep the Vcc stable.
- The C2 and L1 are major components to tune the F0 up or down.
- The recommended tolerance of C and L is +/-2%.

PCB layout example

Below is an example of PCB layout.

- The ground plane must be all covered.
- All the ground point should be considered close each other.
  To make firm the ground connecting
  To make the ground plane as wide as possible

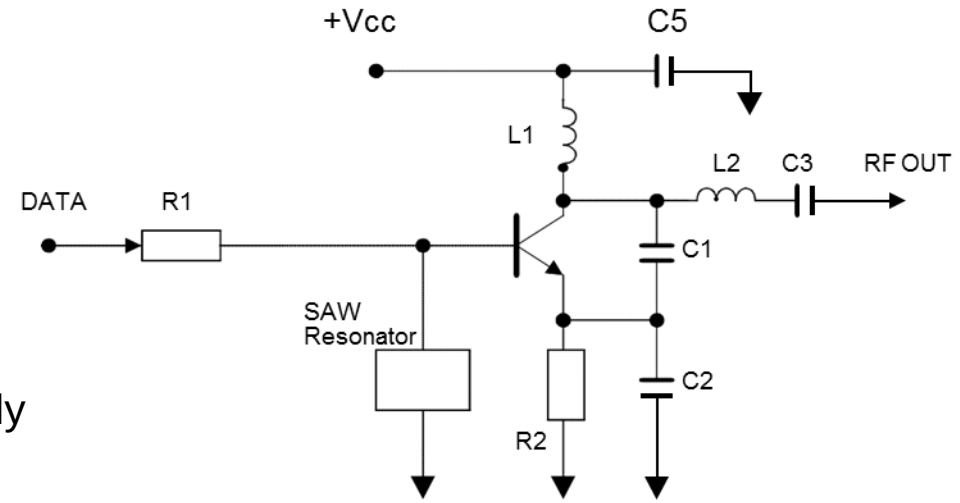


PCB Dimensions : 0.5” x 0.6”

Example of components value to start with

The following are tested value based on the SAW resonator RO3101E, the transistor is NE68030, and the PCB layout shows above.

R1	24K
R2	100 Ohm
C1	6pF
C2	15pF
C3	470pF
C5	470pF
L1	47nH
L2	120nH
Q1	NE68030 with 3V power supply
SAW	RO3101E (433.92MHz)



Note: With different SAW, transistor, +Vcc, or PCB layout, re-tuning the F0 will be needed.