

1. General

The filter is symmetrical, i.e. input and output are exchangeable with each other. But the external coupling coil has to be connected to pin 3 in any case.

The filter can be driven unbalanced only..

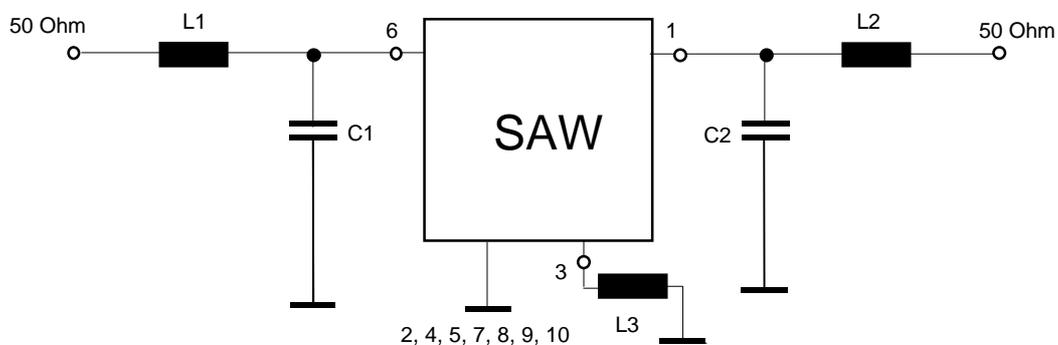
The termination impedances are : **360 Ohm || -3.7 pF**

This impedance is equal for the input and the output. It has to be realised at the point were the filter is mounted. To match this impedance to the impedance of the system a matching circuit is required.

2. Theoretical matching

For the matching of termination impedances to 50 Ohm there can be used two different matching circuits

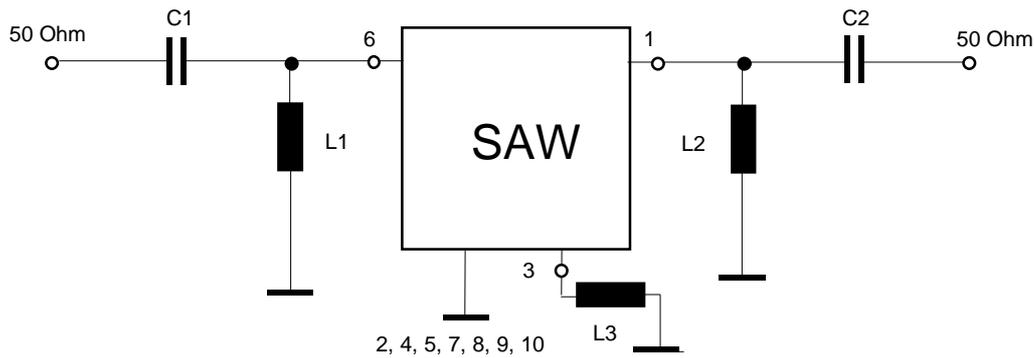
50 Ohm Test circuit 1



The theoretical values of the stated elements are:

$$L1 = L2 = 93.9 \text{ nH}, \quad C1 = C2 = 1.52 \text{ pF}, \quad L3 = 105 \text{ nH}$$

50 Ohm Test circuit 2

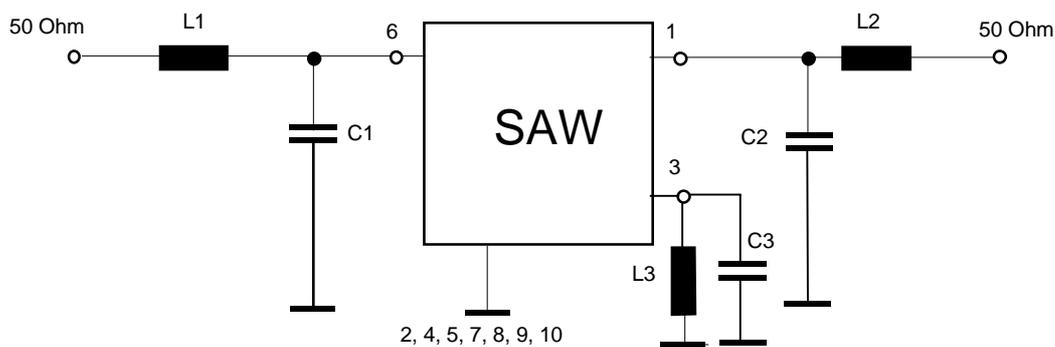


The theoretical values of the stated elements are:

$$C1 = C2 = 6.06 \text{ pF}, \quad L1 = L2 = 63.8 \text{ nH}, \quad L3 = 105 \text{ nH}$$

3. Matching on PCB

Matching on PCB has to take the stray elements of the PCB into consideration. So matching components differ slightly from theoretical values. For matching of a sample in our PCB 'tft030' we have used matching circuit 1.



$$L1 = L2 = 82 \text{ nH}, \\ C1 = C2 = 0.0 \text{ pF}, \quad C3 = 0.5 \text{ pF} \\ L3 = 82 \text{ nH}$$

The strategy to match the filter on the customers board should be as follows:

- match the filter according to theoretical values to 50 Ohm.
Use your final PCB for this matching to be sure to have the stray elements of the PCB then before.
- Adjust external coil according to stray elements of the PCB
The external coil influences the bandwidth of the filter by influencing the upper transition band of the filter only. The position of the lower transition band is not influenced. That means a wrong value for the external coil will lead to wrong bandwidth and wrong centre frequency. The group delay of the filter is influenced in the same way. There are two peaks in group delay behaviour for the matched filter. The peaks in group delay are located at the pass band edges of the filter. Finally this means that only the higher frequency peak in group delay is influenced by the external coil. This makes the adjustment of this coil very easy. Make sure that the distance in frequency of the two group delay peaks is identical with the distance shown in the delivered plots. (around 340 kHz) The matching of the filter will influence the position of the filter only slightly. The height of the peaks is influenced mainly.
- Adjust matching at filter input and filter output
Check VSWR for filter input and output.
- Carry out the matching for the actual source and load impedance in three steps.
Steps one and two are matching of the filter for input or output to source or load impedance respectively. The result of the matching of the filter input to the actual source can be checked via the VSWR at the filter output which is still matched to 50 Ohms and vice versa.
The third step is the matching of the filter input to the actual source and the filter output to the actual load.

If you match the filter immediately to your source and load impedance without following the steps before you will probably find a quite good matching for filter amplitude and group delay performance. But there is no guarantee that VSWR is as specified. This may increase insertion loss and the stability of filter parameters in production.

In case of questions please contact us to