CLAIMS

What is claimed is:

1. A filter comprising:

a coupled multi-mode acoustic wave filter connected between an input terminal and an output terminal;

a first inductor connected between the coupled multi-mode acoustic wave filter and a ground terminal;

an acoustic wave resonator, one end of which is connected between the input terminal or the output terminal and the coupled multi-mode acoustic wave filter; and

a second inductor connected between another end of the acoustic wave resonator and the ground terminal,

wherein:

the first inductor forms a first attenuation pole at a frequency higher than a passband of the filter; and

the acoustic wave resonator and the second indicator form a second attenuation pole at a frequency higher than the first attenuation pole.

2. The filter according to claim 1, further comprising:

a multilayered substrate including dielectric layers and conductive layers; wherein

the coupled multi-mode acoustic wave filter and the acoustic wave resonator are flip-chip mounted on the multilayered substrate, and

the first inductor and the second inductor are formed by at least one of the conductive layers.

3. The filter according to claim 2, wherein

the ground terminal is provided to a first conductive layer other than a second conductive layer in which the coupled multi-mode acoustic wave filter and the acoustic wave resonator are mounted, the first conductive layer and the second conductive layer being included in the conductive layers.

4. The filter according to claim 1, wherein

the coupled multi-mode acoustic wave filter is a coupled multi-mode surface acoustic wave filter.

5. The filter according to claim 1, wherein

the coupled multi-mode acoustic wave filter is a coupled piezoelectric thin film resonator filter.

6. The filter according to claim 1, wherein

the coupled multi-mode acoustic wave filter includes acoustic wave filters connected in parallel between the input terminal and the output terminal.

7. A duplexer comprising:

a reception filter connected between a common terminal and a reception terminal; and

a transmission filter connected between the common terminal and a transmission terminal, wherein

the reception filter is the filter according to claim 1.

CLAIMS

What is claimed is:

1. A filter comprising:

a coupled multi-mode acoustic wave filter connected between an input terminal and an output terminal;

a first inductor connected between the coupled multi-mode acoustic wave filter and a ground terminal;

an acoustic wave resonator, one end of which is connected between the input terminal or the output terminal and the coupled multi-mode acoustic wave filter; and

a second inductor connected between another end of the acoustic wave resonator and the ground terminal.

2. The filter according to claim 1, further comprising:

a multilayered substrate including dielectric layers and conductive layers; wherein

the coupled multi-mode acoustic wave filter and the acoustic wave resonator are flip-chip mounted on the multilayered substrate, and

the first inductor and the second inductor are formed by at least one of the conductive layers.

3. The filter according to claim 2, wherein

the ground terminal is provided to a first conductive layer other than a second conductive layer in which the coupled multi-mode acoustic wave filter and the acoustic wave

resonator are mounted, the first conductive layer and the second conductive layer being included in the conductive layers.

4. The filter according to any one of claims 1 through 3, wherein

the coupled multi-mode acoustic wave filter is a coupled multi-mode surface acoustic wave filter.

5. The filter according to any one of claims 1 through 3, wherein

the coupled multi-mode acoustic wave filter is a coupled piezoelectric thin film resonator filter.

6. The filter according to any one of claims 1 through 5, wherein

the coupled multi-mode acoustic wave filter includes acoustic wave filters connected in parallel between the input terminal and the output terminal.

7. A duplexer comprising:

a reception filter connected between a common terminal and a reception terminal; and

a transmission filter connected between the common terminal and a transmission terminal, wherein

the reception filter is the filter according to any one of claims 1 through 6.