CLAIMS

1. An acoustic wave device comprising:

a piezoelectric substrate;

a dielectric layer formed on the piezoelectric substrate;

a first transmission filter that is connected between a first transmission terminal and a first antenna terminal and has first comb-tooth electrodes formed on the dielectric layer;

a second transmission filter that is connected between a second transmission terminal and a second antenna terminal and has second comb-tooth electrodes formed on the dielectric layer;

a first reception filter that is connected between a first reception terminal and the first antenna terminal; and

a second reception filter that is connected between a second reception terminal and the second antenna terminal,

the dielectric layer having a first thickness between the first comb-tooth electrodes and the piezoelectric substrate and a second thickness between the second comb-tooth electrodes and the piezoelectric substrate, the first and second thicknesses being different from each other.

2. The acoustic wave device according to claim 1,

wherein each of the first transmission filter and the second transmission filter is a transmission filter for one of Band 1 to Band 10, and the first transmission filter and the second transmission filter have different fractional bandwidths.

3. The acoustic wave device according to claim 1 or 2, wherein the dielectric

layer has a first portion on which the first comb-tooth electrodes are formed, and a second portion on which the second comb-tooth electrodes are formed, wherein:

the second portion having a thickness smaller than that of the first portion; and

electrode fingers of the second comb-tooth electrodes and spaces between the electrode fingers are located on the second portion of the dielectric layer.

4. The acoustic wave device according to claim 1 or 2, wherein the dielectric layer has recess portions having a width corresponding to that of electrode fingers of the second comb-tooth electrodes, and the electrode fingers of the second comb-tooth electrodes are formed on the dielectric layer in the recess portions,

wherein the first comb-tooth electrodes are formed on the dielectric layer in a region in which the recess portions are not formed,

wherein the first comb-tooth electrodes and the second comb-tooth electrodes do not contact with the piezoelectric substrate.

5. The acoustic wave device according to any one of claims 1 through 4, wherein the dielectric layer includes aluminum oxide.

6. The acoustic wave device according to any one of claims 1 through 5, further comprising an insulative layer provided so as to cover the dielectric layer, the first comb-tooth electrodes and the second comb-tooth electrodes.

7. The acoustic wave device according to claim 6, wherein the insulative layer includes silicon oxide.

8. A method for manufacturing an acoustic wave device comprising:

forming a dielectric layer on a piezoelectric substrate;

reducing a thickness of the dielectric layer in a second portion and not reducing the thickness of the dielectric layer in a first portion;

forming first comb-tooth electrodes on the dielectric layer in the first portion and forming second comb-tooth electrodes on the dielectric layer in the second portion, simultaneously.

9. A method for manufacturing an acoustic wave device comprising:

forming a dielectric layer on a piezoelectric substrate;

forming an insulative layer on the dielectric layer;

forming first recess portions in the insulative layer in a first portion, the first recces portions reaching to an upper surface of the dielectric layer;

forming first comb-tooth electrodes on the dielectric layer in the first recess portions, a width of electrode fingers of the first comb-tooth electrodes being corresponding to a width of the first recess portions;

forming second recess portions in the insulative layer in a second portion, the second recess portions reaching to an inside of the dielectric layer; and

forming second comb-tooth electrodes on the dielectric layer in the second recess portions, a width of electrode fingers of the second comb-tooth electrodes being corresponding to a width of the second recess portions.

CLAIMS

What is claimed is:

1. An acoustic wave device comprising:

a piezoelectric substrate;

a dielectric layer formed on the piezoelectric substrate; and

first and second comb-tooth electrodes formed on the dielectric layer,

the dielectric layer having a first thickness between the first comb-tooth electrodes and the piezoelectric substrate and a second thickness between the second comb-tooth electrodes and the piezoelectric substrate, the first and second thicknesses being different from each other.

2. The acoustic wave device according to claim 1, further comprising:

a first filter including the first comb-tooth electrodes;

a second filter including the second comb-tooth electrodes,

the first filter being connected to a signal system different from that to which the second filter is connected.

3. The acoustic wave device according to claim 2, where the first and second filters have different fractional bandwidths.

4. The acoustic wave device according to claim 1, wherein the dielectric layer has a first portion on which the first comb-tooth electrodes are formed, and a second portion on which the second comb-tooth electrodes are formed, wherein:

the second portion having a thickness smaller than that of the first portion; and

electrode fingers of the second comb-tooth electrodes and spaces between the electrode fingers are located on the second portion of the dielectric layer.

5. The acoustic wave device according to claim 1, wherein the dielectric layer has recess portions having a width corresponding to that of electrode fingers of the second comb-tooth electrodes, and the electrode fingers of the second comb-tooth electrodes are formed in the recess portions.

6. The acoustic wave device according to claim 1, wherein the dielectric layer includes aluminum oxide.

7. The acoustic wave device according to claim 1, further comprising an insulative layer provided so as to cover the dielectric layer, the first comb-tooth electrodes and the second comb-tooth electrodes.

8. The acoustic wave device according to claim 7, wherein the insulative layer includes silicon oxide.

9. A method for manufacturing an acoustic wave device comprising:

forming a dielectric layer on a piezoelectric substrate, the dielectric layer having first and second portions having different thicknesses;

forming first comb-tooth electrodes on the first portion; and

forming second comb-tooth electrodes on the second portion.