Claims

1. A MEMS device formed using the materials of the BEOL of a CMOS process, wherein:

a post-processing of vHF and post backing was applied to form the MEMS device,

a total size of the MEMS device is between 50um and 150um; and

wherein the device includes a central part having a round shape and has springs around the central part that have a spiral shape.

2. The MEMS device of claim 1, wherein the total size of the MEMS device is less than 100um.

3. The MEMS device of any of claims 1 and 2 further comprising a set of at least three springs distributed evenly around the MEMS device and rotated around a central axis of the MEMS device.

4. The MEMS device of any of claims 1-3, wherein the springs are made with one of a single metal layer and a stack-up of at least two metal layers.

5. The MEMS device of any of claims 1-4, wherein the MEMS device is an inertial sensor.

6. The MEMS device of any of claims 1-5 comprising a proof mass, wherein the proof mass is made with a stack-up of four metal layers and the springs, wherein the springs are one of: made and connected with a top metal layer of the proof mass forming the stack-up and connected with two top metal layers of the stack-up.

7. The MEMS device of any of claims 1-6, wherein the springs are connected to an external ring such that a portion thereof remains buried into a silicon oxide on its outer edge after the vHF etching.

8. The MEMS device of any of claims 1-7, wherein the MEMS device has a top metal plane and a bottom metal plane that is smaller than the top one.

9. The MEMS device of claim 8, wherein an outer ring width of the bottom metal plane is less than or equal to 10% to 50% the width of an outer ring of the top metal plane.

10. The MEMS device of any of claims 1-9, wherein the MEMS device is formed within a MEMS cavity that does not include metal filling structures.

11.A MEMS device comprising a set of at least three springs distributed evenly around the MEMS device and rotated around a central axis of the MEMS device;

wherein the device includes a central part having a round shape and has springs around the central part that have a spiral shape.

12. The MEMS device of claim 11, wherein the springs are made with one of a single metal layer and a stack-up of at least two metal layers.

13. The MEMS device of any of claims 11-12, wherein the MEMS device is an inertial sensor.

14. The MEMS device of any of claims 11-13 comprising a proof mass, wherein the proof mass is made with a stack-up of four metal layers and the springs, wherein the springs are one of: connected with a top metal layer of the proof mass forming the stack-up and connected with two top metal layers of the stack-up.

15. A method for manufacturing a MEMS device using the materials of the BEOL of a CMOS process comprising:

applying a post-processing of vHF and post backing to form the MEMS device, and

wherein a total size of the MEMS device is between 50um and 150um; and

wherein the device includes a central part having a round shape and has springs around the central part that have a spiral shape.

16. The method of claim 15, wherein the total size of the MEMS device is less than 100um.

17. The method of any of claims 15 and 16 further comprising forming a set of at least three springs distributed evenly around the MEMS device and rotated around a central axis of the MEMS device.

18. The method of any of claim 15-17 comprising forming the springs with one of a single metal layer and a stack-up of at least two metal layers.

19. The method of any of claims 15-18, wherein the MEMS device is an inertial sensor.

20. The method of any of claims 15-19 comprising forming a proof mass, wherein the proof mass is made with a stack-up of four metal layers and the springs, and wherein the springs are one of: connected with a top metal layer of the proof mass forming the stack-up and connected with two top metal layers of the stack-up.

21. The method of any of claim 15-20 comprising connecting the springs to an external ring such that a portion thereof remains buried into a silicon oxide on its outer edge after the vHF etching.

22. The method of any of claims 15-21 comprising forming the MEMS device to have a top metal plane and a bottom metal plane that is smaller than the top metal plane.

23. The method of claim 22 comprising forming an outer ring width of the bottom metal plane that is less than or equal to 10% to 50% the width of an outer ring of the top metal plane.

24. The method of any of claims 15-23 comprising forming the MEMS device within a MEMS cavity that does not include metal filling structures.

25. A method for manufacturing a MEMS device comprising forming a set of at least three springs distributed evenly around the MEMS device and rotated around a central axis of the MEMS device and forming a shape of the MEMS device that is round and forming the springs to have a spiral shape.

26. The method of claim 25 comprising forming the springs with one of a single metal layer and a stack-up of at least two metal layers.

27. The method of any of claims 25-26, wherein the MEMS device is an inertial sensor.

28. The method of any of claims 25-27 comprising forming a proof mass, wherein the proof mass is made with a stack-up of four metal layers and the springs, wherein the springs are one of: connected with a top metal layer of the proof mass forming the stack-up and connected with two top metal layers of the stack-up.

29. A smartphone, wearable, earbud, or Internet-of-Things (IoT) device including the MEMS device according to any one of claims 1-14.