on-state resistance that is rather low for state-of-the-art technologies. But in reference to figure 2, the connection between the row $RFIN_1$ to column $RFOUT_4$ meets seven times the on-resistance, which increases dramatically the insertion loss. Furthermore, the switch element S1 between the row transmission line and the column transmission line detrimentally increases the bulkiness of the crosspoint switch device.

SummaryObjective of the invention

EmbodimentsAn objective of the invention seekis to providepose a novel RF MEMS switch crosspoint for crosspoint switch matrix applications or the like, said RF MEMS switch crosspoint enabling to achieve a lower insertion loss for the RF signals that are routed through a crosspoint switch matrix or the like. Said novel RF MEMS switch crosspoint may beis also compact and may enables the construction of large switch matrices with a reduced number of switches which by consequence simplifies control.

Summary of the invention

This objective is achieved by the RF MEMS crosspoint switch of claim 1.According to a first aspect of the invention, there is provided a RF MEMS crosspoint switch comprising a first transmission line and a second transmission line that crosses the first transmission line, wherein the first transmission line comprises two spaced-apart transmission line portions, and a switch element that permanently electrically connects the said two spaced-apart transmission line portions, wherein the second transmission line crosses the first transmission line between the two spaced-apart transmission line portions, the RF MEMS crosspoint switch further comprising actuation means for actuating the switch element at least between a first position, in which the switch element is electrically connecting the said two spaced-apart transmission line portions of the first transmission line and the first and second transmission lines are electrically disconnected, and a second position, in which the switch element is electrically connecting the said two spaced-apart transmission line portions of the first transmission line and is also electrically connecting the two transmission lines together.

In the RF MEMS crosspoint switch in the embodiments of the invention, only one switch element can be advantageously used, which may dramatically reduces the insertion loss for RF signals in switch matrix applications. Furthermore, the RF MEMS crosspoint switch of the invention can be easily constructed in a more compact way, compared to the crosspoint device disclosed in US patent 6 888 420.

~~More particularly and optionally, the RF MEMS crosspoint switch of the invention can comprise any one of the optional characteristics of claims 2 to 11.~~

~~The invention also relates to~~According to a second aspect of the invention, there is provided a RF MEMS switch matrix comprising several row transmission lines, and several column transmission lines that cross the row transmission lines, said matrix comprising at each crosspoint a RF MEMS crosspoint switch of the first aspect~~claim 1~~.

According to a third aspect of the invention, there is provided a use of the RF MEMS switch matrix of second aspect for routing RF signals.

Brief description of the drawings

CLAIMS

1. A RF MEMS crosspoint switch ~~(1)~~ comprising a first transmission ~~(10)~~ line and a second transmission line ~~(11)~~ that crosses the first transmission line, wherein the first transmission line ~~(10)~~ comprises two spaced-apart transmission line portions ~~(100, 101)~~, and a switch element ~~(12)~~ that permanently electrically connects the said two spaced-apart transmission line portions ~~(100, 101)~~, wherein the second transmission line ~~(11)~~ crosses the first transmission line ~~(10)~~ between the two spaced-apart transmission line portions ~~(100, 101)~~, the RF MEMS crosspoint switch ~~(1)~~ further comprising actuation means ~~(121)~~ for actuating the switch element ~~(12)~~ at least between a first position, in which the switch element ~~(12)~~ is electrically connecting the said two spaced-apart transmission line portions ~~(100, 101)~~ of the first transmission line ~~(10)~~ and the first ~~(10)~~ and second ~~(11)~~ transmission lines are electrically disconnected, and a second position, in which the switch element ~~(12)~~ is electrically connecting the said two spaced-apart transmission line portions ~~(100, 101)~~ of the first transmission line ~~(10)~~ and is also electrically connecting the two transmission lines ~~(10, 11)~~ together.
2. The RF MEMS crosspoint switch of claim 1, wherein the switch element ~~(12)~~ comprises a flexible membrane ~~(120a)~~.
3. The RF MEMS crosspoint switch of claim 2, wherein the flexible membrane ~~(120a)~~ is supported by at least one pillar ~~(120b)~~, and the membrane ~~(120a)~~ and the at least one pillar ~~(120b)~~ are forming a part of the first transmission line ~~(10)~~.
4. The RF MEMS crosspoint switch of claim 3, wherein the flexible membrane ~~(120a)~~ is anchorless and can freely slide relatively to the at least one pillar ~~(120b)~~ during its bending movement.
5. The RF MEMS crosspoint switch of any one of claims 1 to 3 wherein the switch element ~~(12)~~ is anchored to the substrate.

6. The RF MEMS crosspoint switch of claim 5 wherein the switch element ~~(12)~~ is anchored to the substrate at both ends and forms a bridge.
7. The RF MEMS crosspoint switch of claim 5, wherein the switch element ~~(12)~~ is anchored to the substrate at only one end and forms a cantilever switch element.
8. The RF MEMS crosspoint switch of any one of claims 1 to 7, wherein the actuation means are adapted to bend down the switch element ~~(12)~~ into a down forced state corresponding the said second position.
9. The RF MEMS crosspoint switch of any one of claims 1 to 8, wherein the actuation means are adapted to bend up the switch element ~~(12)~~ into an up forced state corresponding to the said first position.
10. The RF MEMS crosspoint switch of any one of claims 1 to 9, wherein the switch element ~~(12)~~ is adapted to provide an ohmic contact with the second transmission line ~~(11)~~.
11. The RF MEMS crosspoint switch of any one of claims 1 to 9, wherein the switch element ~~(12)~~ is adapted to provide a capacitive coupling with the second transmission line ~~(11)~~.
12. A RF MEMS switch matrix comprising several row transmission lines ~~($RF\text{-}R_i$)~~, and several column transmission lines ~~($RF\text{-}C_j$)~~, that cross the row transmission lines, and comprising at each crosspoint a RF MEMS crosspoint switch ~~($SW_{i,j}$)~~ according to any one of claims 1 to 11.
13. The use of the RF MEMS switch matrix of claim 12 for routing RF signals.