SYSTEMS, CIRCUITS AND METHODS RELATED TO LOW-LOSS BYPASS OF A RADIO-FREQUENCY FILTER OR DIPLEXER

BACKGROUND

Field

[0001] The present disclosure generally relates to systems and methods associated with low-loss bypass of a radio-frequency filter or diplexer.

Description of the Related Art

[0002] In a radio-frequency (RF) system, a filter or diplexer is typically needed or desired in some conditions. When not needed, it can be desirable to bypass the filter or diplexer to avoid incurring loss associated with the filter or diplexer.

SUMMARY

[0002a] According to a first aspect, a switching network circuitry is provided, comprising a first switch that includes an input pole configured to receive a radio-frequency (RF) signal, a pass-through throw connected to an RF component and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the RF component, and at least one bypass throw each connected to an output path and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the output path; and a second switch implemented between each of the at least one output path and a corresponding output of the RF component, the second switch configured to allow routing of the RF signal from the input pole to the output path through the RF component when in a first state, and to allow routing of the RF signal from the input pole to the output path while bypassing the RF component when in a second state.

[0002b] According to a second aspect, a semiconductor die is provided, comprising a substrate configured to receive a plurality of components; and a switching network disposed on the substrate, the switching network including a first switch having an input pole configured to receive a radio-frequency (RF) signal, a pass-through throw connected to an RF component and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the RF component, and at least one bypass throw each connected to an output path and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the output path, the switching network further including a second switch implemented between each of the at least one output path and a corresponding output of the RF component, the second switch configured to allow routing of the RF signal from the input

pole to the output path through the RF component when in a first state, and to allow routing of the RF signal from the input pole to the output path while bypassing the RF component when in a second state.

[0002c] According to a third aspect, a method for fabricating a device having a bypass architecture is provided, the method comprising forming or providing a first switch that includes a pass-through throw and at least one bypass throw for bypassing of a radio-frequency (RF) signal; connecting the pass-through throw of the first switch to an RF component; connecting each of the at least one bypass throw to a corresponding output path; and forming or providing a second switch between each of the at least one output path and a corresponding output of the RF component, such that the RF signal is routed from the first switch to the output path through the RF component when the second Switch is in a first state, and the RF signal is routed from the first switch to the output path while bypassing the RF component when the second switch is in a second state.

[0003] In accordance with a number of implementations, the present disclosure relates to a switching network circuitry that includes a first switch having an input pole configured to receive a radio-frequency (RF) signal, a pass-through throw configured to be connectable to the input pole to allow routing of the RF signal to an RF component, and at least one dedicated bypass throw configured to be connectable to the input pole and at least one bypass conduction path. The switching network circuitry further includes a second switch having a pole and a throw. The second switch is configured to be connectable between an output of the RF component and the bypass conduction path.

[0004] In some embodiments, the second switch can include at least one single-pole-single-throw (SPST) switch. The second switch can include one SPST switch for each channel of the output of the RF component. Each of the one or more SPST switches can be in an open state when the circuitry is in a bypass mode, and in a closed state when the circuitry is in a pass-through mode.

[0005] In some embodiments, the first switch can be a single-pole-multiple-throw (SPMT) switch such that the single pole is the input pole and the multiple throws include the pass-through throw and the at least one dedicated bypass throw. In some embodiments, the RF component can include a filter. In

What is claimed is:

1. A switching network circuitry comprising:

a first switch that includes an input pole configured to receive a radio-frequency (RF) signal, a pass-through throw connected to an RF component and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the RF component, and at least one bypass throw each connected to an output path and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the output path; and

a second switch implemented between each of the at least one output path and a corresponding output of the RF component, the second switch configured to allow routing of the RF signal from the input pole to the output path through the RF component when in a first state, and to allow routing of the RF signal from the input pole to the output path while bypassing the RF component when in a second state.

2. The circuitry of claim 1 wherein each of the at least one second switch includes a single-pole-single-throw (SPST) switch.

3. The circuitry of claim 1 wherein RF signal is routed through the first switch and the second switch when the second switch is in the first state, and through only the first switch when the second switch is in the second state.

4. The circuitry of claim 3 wherein the second switch is in an open state when in the first state, and in a closed state when in the second state.

5. The circuitry of claim 1 wherein the first switch is a single-pole-multiple-throw (SPMT) switch such that the single pole is the input pole and the multiple throws include the pass-through throw and the at least one bypass throw.

6. The circuitry of claim 5 wherein the RF component includes a filter.

7. The circuitry of claim 5 wherein the at least one bypass throw includes two or more throws.

8. The circuitry of claim 7 wherein the RF component includes a diplexer.

9. A semiconductor die comprising:

a substrate configured to receive a plurality of components; and

a switching network disposed on the substrate, the switching network including a first switch having an input pole configured to receive a radio-frequency (RF) signal, a pass-through throw connected to an RF component and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the RF component, and at least one bypass throw each connected to an output path and configured to be connectable to the input pole to allow routing of the RF signal from the input pole to the output path, the switching network further including a second switch implemented between each of the at least one output path and a corresponding output of the RF component, the second switch configured to allow routing of the RF signal from the input pole to the output path through the RF component when in a first state, and to allow routing of the RF signal from the input pole to the output path while bypassing the RF component when in a second state.

10. The semiconductor die of claim 9 wherein the switching network is implemented as silicon-on-insulator (SOI) process technology.

11. The semiconductor die of claim 9 wherein the switching network is implemented as pseudomorphic high-electron-mobility transistor (pHEMT) process technology.

12. A method for fabricating a device having a bypass architecture, the method comprising:

forming or providing a first switch that includes a pass-through throw and at least one bypass throw for bypassing of a radio-frequency (RF) signal;

connecting the pass-through throw of the first switch to an RF component;

connecting each of the at least one bypass throw to a corresponding output path; and

forming or providing a second switch between each of the at least one output path and a corresponding output of the RF component, such that the RF signal is routed from the first switch to the output path through the RF component when the second Switch is in a first state, and the RF signal is routed from the first switch to the output path while bypassing the RF component when the second switch is in a second state.

13. The method of claim 12 wherein the RF component includes a filter.

14. The method of claim 12 wherein the RF component includes a diplexer.