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(54) **SEMICONDUCTOR DEVICE AND
OPERATION METHOD THEREOF**

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(57) **ABSTRACT**

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A device includes a substrate, a first electrode and a second electrode. The first electrode is disposed on the substrate, and configured to receive an input signal. The second electrode is disposed on the substrate, and configured to output an output signal based on the input signal. When the input signal is configured to oscillate within a first range between a first voltage value and a second voltage value with a first frequency, the output signal is an inverted version of the input signal, and has the first frequency. When the input signal is configured to oscillate within a second range including the first voltage value without the second voltage value with the first frequency, the output signal has a second frequency which is approximately twice of the first frequency.

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