US 20240180040A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0180040 A1**

Solanki (43) **Pub. Date: May 30, 2024**

(54) **ACOUSTIC TRANSISTOR**

(71) Applicant: **Portland State University**, Portland, OR (US)

(72) Inventor: **Rajendra Solanki**, Portland, OR (US)

(73) Assignee: **Portland State University**, Portland, OR (US)

(21) Appl. No.: **18/521,473**

(22) Filed: **Nov. 28, 2023**

Related U.S. Application Data

(60) Provisional application No. 63/428,684, filed on Nov. 29, 2022.

Publication Classification

(51) **Int. Cl.**

H10N 30/00	(2006.01)
H10N 30/80	(2006.01)
H10N 30/853	(2006.01)
H10N 39/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H10N 30/1071*** (2023.02); ***H10N 30/802*** (2023.02); ***H10N 30/853*** (2023.02); ***H10N 39/00*** (2023.02)

(57) **ABSTRACT**

A MOSFET is turned On and Off by applying an acoustic signal to a material having a piezoelectric effect to generate a charge creating a conducting path at the silicon/gate oxide interface. In an acoustic transistor, instead of the gate voltage, the accumulation of the charge under the oxide region is created by a piezoelectric material stimulated by an acoustic (sound) wave from an acoustic generator. A piezoelectric thin film, such as Aluminum Nitride or HfSiO, can be deposited near the transistor to stimulate the signal and another piezo film also on top of the silicon oxide/aluminum gate. The acoustic waves from a signal generator on the silicon surface bounce within the substrate and stimulate the piezo film on top of the gate oxide. This results in electric charge across the oxide film, induced by the piezo film on top of the gate and turns on and off the transistor.