



(51) International Patent Classification:

H03H 9/17 (2006.01) H01L 41/04 (2006.01)
H03H 9/13 (2006.01) H01L 41/22 (2013.01)
H03H 3/02 (2006.01)

(21) International Application Number:

PCT/SG2021/050151

(22) International Filing Date:

22 March 2021 (22.03.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(71) Applicant: **AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH** [SG/SG]; 1 Fusionopolis Way, #20-10 Connexis North Tower, Singapore 138632 (SG).

(72) Inventors: **GHOSH, Sagnik**; c/o Industry Development, Institute of Microelectronics, 2 Fusionopolis Way, #08-02 Innovis Tower, Singapore 138634 (SG). **NG, Eldwin Jiaqiang**; c/o Industry Development, Institute of Micro-

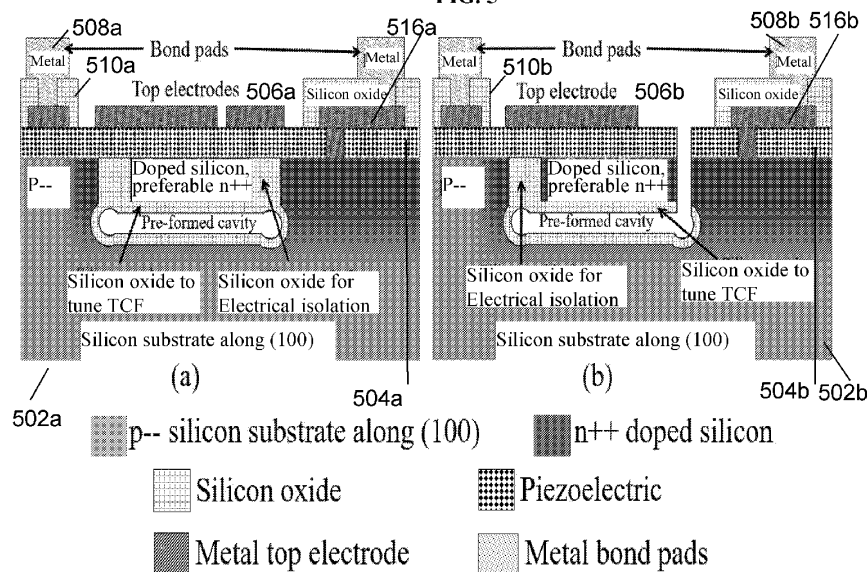
electronics, 2 Fusionopolis Way, #08-02 Innovis Tower, Singapore 138634 (SG). **SHARMA, Jaibir**; c/o Industry Development, Institute of Microelectronics, 2 Fusionopolis Way, #08-02 Innovis Tower, Singapore 138634 (SG). **MERUGU, Srinivas**; c/o Industry Development, Institute of Microelectronics, 2 Fusionopolis Way, #08-02 Innovis Tower, Singapore 138634 (SG).

(74) Agent: **VIERING, JENTSCHURA & PARTNER LLP**; P.O. Box 1088, Rochor Post Office, Rochor Road, Singapore 911833 (SG).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW,

(54) Title: RESONATOR AND METHOD OF FORMING THE SAME

FIG. 5



(57) Abstract: Various embodiments may relate to a resonator. The resonator may include a support including a substrate portion, and a membrane portion extending from the substrate portion over a cavity. The resonator may also include a piezoelectric layer on the membrane portion. The resonator may further include an electrode on the piezoelectric layer. The substrate portion may include dopants of a first conductivity type. The membrane portion may include dopants of a second conductivity type different from the first conductivity type. A ratio of a thickness of the membrane portion to a combined thickness of the electrode and the piezoelectric layer may be above 3 : 1 for temperature compensation.

[Continued on next page]

SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*