



US 20240213952A1

(19) **United States**

(12) **Patent Application Publication**
Hashi et al.

(10) **Pub. No.: US 2024/0213952 A1**

(43) **Pub. Date: Jun. 27, 2024**

(54) **RESONATOR DEVICE**

(71) Applicant: **SEIKO EPSON CORPORATION**,
Tokyo (JP)

(72) Inventors: **Yukihiro Hashi**, Shiojiri-shi (JP);
Junichi Takeuchi, Chino-shi (JP);
Tomoyuki Kamakura, Matsumoto-shi
(JP)

(21) Appl. No.: **18/392,809**

(22) Filed: **Dec. 21, 2023**

(30) **Foreign Application Priority Data**

Dec. 26, 2022 (JP) 2022-207948

Publication Classification

(51) **Int. Cl.**
H03H 9/10 (2006.01)
H03H 3/02 (2006.01)
H03H 9/19 (2006.01)

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

CPC **H03H 9/1021** (2013.01); **H03H 3/02**
(2013.01); **H03H 9/19** (2013.01)

(57) **ABSTRACT**

A resonator device includes: a base substrate having a first surface and a second surface in a front-to-back relationship with the first surface; a resonator element located on a first surface side of the base substrate and including a resonator substrate and an electrode terminal disposed at a base-substrate-side surface of the resonator substrate; a mounting terminal disposed at the first surface; and a metal bump disposed between the base substrate and the resonator element, the metal bump being configured to bond the base substrate and the resonator element and electrically couple the mounting terminal and the electrode terminal. A cross-sectional area of the metal bump at a bonding portion with the resonator element is $491\ \mu\text{m}^2$ or more and $4007\ \mu\text{m}^2$ or less.

