



US 20230230940A1

(19) **United States**(12) **Patent Application Publication**
KODA et al.(10) **Pub. No.: US 2023/0230940 A1**(43) **Pub. Date: Jul. 20, 2023**(54) **SEMICONDUCTOR DEVICE****H01L 25/16** (2006.01)**H01L 23/31** (2006.01)(71) Applicant: **Mitsubishi Electric Corporation,**
Tokyo (JP)(52) **U.S. Cl.****CPC** **H01L 23/60** (2013.01); **H01L 23/49537**(2013.01); **H01L 25/16** (2013.01); **H01L****23/49562** (2013.01); **H01L 23/315** (2013.01);**H01L 24/48** (2013.01)(72) Inventors: **Kazuki KODA**, Tokyo (JP); **Shuhei**
YOKOYAMA, Tokyo (JP); **Naoki**
IKEDA, Tokyo (JP); **Shogo SHIBATA**,
Tokyo (JP)

(57)

ABSTRACT(73) Assignee: **Mitsubishi Electric Corporation,**
Tokyo (JP)(21) Appl. No.: **18/048,483**(22) Filed: **Oct. 21, 2022**(30) **Foreign Application Priority Data**

Jan. 19, 2022 (JP) 2022-006364

Publication Classification(51) **Int. Cl.****H01L 23/60** (2006.01)**H01L 23/495** (2006.01)

A semiconductor device includes: semiconductor elements; a package sealing the semiconductor elements and being rectangular in a top view; control terminals protruding from a first side of the package; output terminals protruding from a second side facing the first side of the package; and a recessed portion formed in a third side adjacent to the first side and the second side of the package, wherein a part of the control terminals is disposed at end portions of lead frames, the semiconductor device further includes dummy terminals disposed at other end portions of the lead frames, respectively, the dummy terminals protruding from the recessed portion, and an amount of the protrusion of each of the dummy terminals from the recessed portion is smaller than or equal to 0.75 mm.

