



US 20240213190A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0213190 A1**

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

(54) **PROFILE CONTROL FOR STRESS
RELAXATION**

(71) Applicant: **Taiwan Semiconductor
Manufacturing Company, Ltd.,
Hsinchu (TW)**

(72) Inventors: **Chia-Nan Lin**, Chiayi (TW);
Yen-Cheng Lin, Taipei (TW);
Jiann-Horng Lin, Hsinchu (TW)

(73) Assignee: **Taiwan Semiconductor
Manufacturing Company, Ltd.,
Hsinchu (TW)**

(21) Appl. No.: **18/163,995**

(22) Filed: **Feb. 3, 2023**

Related U.S. Application Data

(60) Provisional application No. 63/477,003, filed on Dec.
23, 2022.

Publication Classification

(51) **Int. Cl.**
H01L 23/00 (2006.01)

(52) **U.S. Cl.**
CPC **H01L 24/02** (2013.01); **H01L 24/05**
(2013.01); **H01L 24/13** (2013.01); **H01L 28/60**
(2013.01); **H01L 2224/02313** (2013.01); **H01L**

2224/0235 (2013.01); **H01L 2224/0239**
(2013.01); **H01L 2224/0401** (2013.01); **H01L**
2224/05558 (2013.01); **H01L 2224/05569**
(2013.01); **H01L 2224/05647** (2013.01); **H01L**
2224/05666 (2013.01); **H01L 2224/13082**
(2013.01); **H01L 2224/13147** (2013.01); **H01L**
2924/01013 (2013.01); **H01L 2924/01029**
(2013.01); **H01L 2924/0132** (2013.01)

(57)

ABSTRACT

A method includes: providing a passivation layer with an embedded MIM capacitor; forming a redistribution layer (RDL) above the passivation layer; and forming an opening in the RDL above the MIM capacitor, wherein the opening separates the RDL into first and second RDL structures, wherein each of the first and second RDL structures has a convex-shaped profile on a sidewall that defines the opening that separates the first RDL structure from the second RDL structure, and wherein the convex-shaped profile on the sidewalls resists stress migration from the RDL to the MIM capacitor to resist stress migration induced cracks forming in the MIM capacitor. The forming an opening includes: removing a portion of the RDL to a first depth using first etching operations; and removing a portion of the RDL to a second depth by laterally etching sidewalls of the first and second RDL structures.

