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Wang et al.(10) **Pub. No.: US 2024/0213333 A1**(43) **Pub. Date: Jun. 27, 2024**(54) **III-N DEVICE WITH PLANARIZED
TOPOLOGICAL STRUCTURE****H01L 29/66** (2006.01)**H01L 29/778** (2006.01)(52) **U.S. Cl.**CPC **H01L 29/408** (2013.01); **H01L 21/0217**
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H01L 23/49562 (2013.01); **H01L 29/2003**
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29/7786 (2013.01)(71) Applicant: **Texas Instruments Incorporated,**
Dallas, TX (US)(72) Inventors: **Fuchao Wang**, Plano, TX (US); **Bill**
Wofford, Sunnyvale, TX (US); **Jonathan R Garrett**, Garland, TX
(US); **Ebenezer Eshun**, Frisco, TX
(US); **Jungwoo Joh**, Allen, TX (US)(21) Appl. No.: **18/145,625**(22) Filed: **Dec. 22, 2022****Publication Classification**(51) **Int. Cl.****H01L 29/40** (2006.01)**H01L 21/02** (2006.01)**H01L 21/3105** (2006.01)**H01L 23/495** (2006.01)**H01L 29/20** (2006.01)(57) **ABSTRACT**

A microelectronic device includes a III-N semiconductor layer having a top surface with at least one topological structure in the III-N semiconductor layer. The topological structure may be an opening in the III-N semiconductor layer or a protrusion of the III-N semiconductor layer. The microelectronic device also includes a liner including silicon nitride on the topological structure, contacting the III-N semiconductor layer. The microelectronic device further includes a fill material including silicon nitride on the topological structure on the liner. A top surface of the fill material is planar and parallel to the top surface of the III-N semiconductor layer adjacent to the topological structure.

