US007233028B2

(12) **United States Patent**
Weeks et al.

(10) **Patent No.: US 7,233,028 B2**
(45) **Date of Patent: Jun. 19, 2007**

(54) **GALLIUM NITRIDE MATERIAL DEVICES AND METHODS OF FORMING THE SAME**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/650,122**

(22) Filed: **Aug. 25, 2003**

(65) **Prior Publication Data**

US 2004/0130002 A1 Jul. 8, 2004

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/792,414, filed on Feb. 23, 2001, now Pat. No. 6,611,002.

(51) **Int. Cl.**
H01L 29/06 (2006.01)

(52) **U.S. Cl.** **257/98**; 257/94; 257/95; 257/622; 257/623; 257/E33.005

(58) **Field of Classification Search** 257/94, 257/95, 622, 623, 98, E33.005; 438/22, 438/29, 978

See application file for complete search history.

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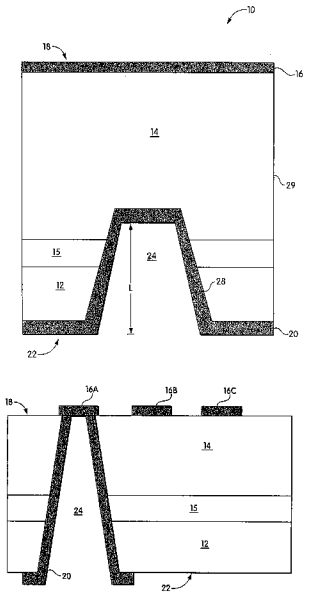
(57) **ABSTRACT**

The invention provides gallium nitride material devices, structures and methods of forming the same. The devices include a gallium nitride material formed over a substrate, such as silicon. Exemplary devices include light emitting devices (e.g., LED's, lasers), light detecting devices (such as detectors and sensors), power rectifier diodes and FETs (e.g., HFETs), amongst others.

47 Claims, 28 Drawing Sheets