US006184545B1

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

(10) **Patent No.: US 6,184,545 B1**
(45) **Date of Patent: Feb. 6, 2001**

(54) **SEMICONDUCTOR COMPONENT WITH METAL-SEMICONDUCTOR JUNCTION WITH LOW REVERSE CURRENT**

(75) Inventors: **Wolfgang Werner**, Munich; **Jenoe Tihanyi**, Kirchheim, both of (DE)

(73) Assignee: **Infineon Technologies AG**, Munich (DE)

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **09/152,827**

(22) Filed: **Sep. 14, 1998**

(30) **Foreign Application Priority Data**

Sep. 12, 1997 (DE) 197 40 195

(51) **Int. Cl.**[7] **H01L 29/74**; H01L 29/085; H01L 29/095

(52) **U.S. Cl.** **257/109**; 257/471; 257/475; 257/484

(58) **Field of Search** 257/484, 483, 257/342, 109, 481, 475, 471; 326/131

(56) **References Cited**

U.S. PATENT DOCUMENTS

H40	*	4/1986	Buchanan et al.	257/484
4,110,775	*	8/1978	Festa	257/484
4,134,123	*	1/1979	Shannon	257/484
4,862,229	*	8/1989	Mundy et al.	257/484
5,017,976	*	5/1991	Sugita	257/494
5,081,509	*	1/1992	Kozaka et al.	257/106
5,101,244	*	3/1992	Mori et al.	257/260
5,371,400	*	12/1994	Sakurai	257/478
5,438,215	*	8/1995	Tihanyi	257/401
5,917,228	*	6/1999	Matsuda et al.	257/453

FOREIGN PATENT DOCUMENTS

43 09 764 A1 9/1994 (DE) .

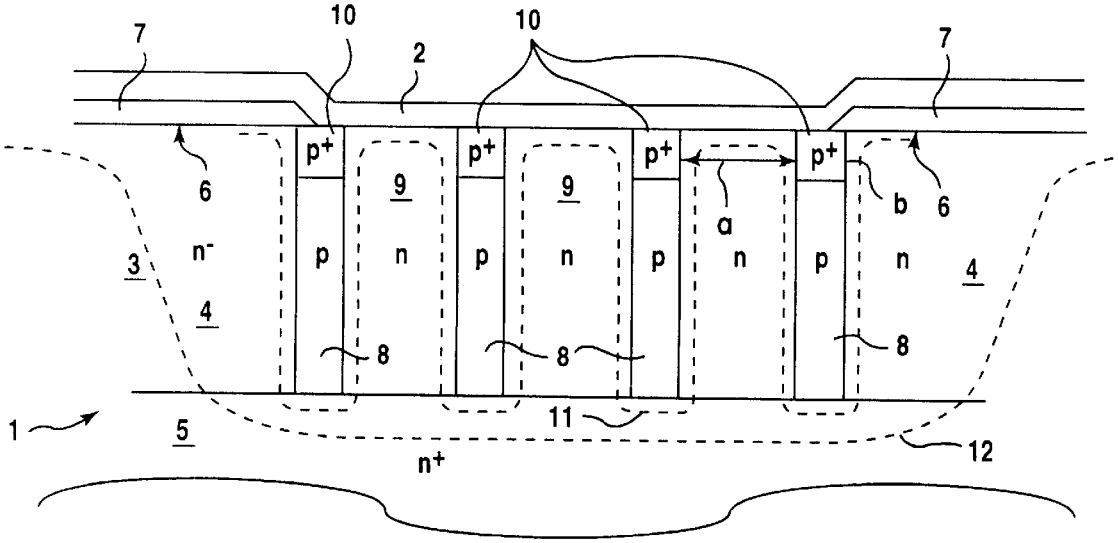
OTHER PUBLICATIONS

"Physics of Semiconductor Devices" (Sze), Wiley Interscience Publication, 2nd edition, New Jersey, pp. 250–254.
"The Merged P–I–N Schottky (MPS) Rectifier: A High Voltage, High Speed Power Diode" (Baliga et al.), IEDM 1987, pp. 658–661.

* cited by examiner

Primary Examiner—Minh Loan Tran
Assistant Examiner—Shouxiang Hu
(74) *Attorney, Agent, or Firm*—Herbert L. Lerner; Laurence A. Greenberg; Werner H. Stemer

(57) **ABSTRACT**

The semiconductor component, such as a Schottky diode with a low leakage current, has a metal-semiconductor junction between a first metal electrode and the semiconductor. The semiconductor, which is of a first conductivity type, has a defined drift path and a plurality of supplementary zones of a second conductivity type extending from the semiconductor surface into the drift path. A number of foreign atoms in the supplementary zones is substantially equal to a number of foreign atoms in intermediate zones surrounding the supplementary zones and the number of foreign atoms does not exceed a number corresponding to a breakdown charge of the semiconductor.

8 Claims, 1 Drawing Sheet