Title (en)

TRENCH MOSFET WITH RECESSED CLAMPING DIODE

Title (de)

GRABEN-MOSFET MIT AUSGESPARTER KLEMMDIODE

Title (fr)

TRANSISTOR MOS A TRANCHES COMPRENANT UNE DIODE DE BLOCAGE

Publication

EP 1761953 A1 20070314 (EN)

Application

EP 04756535 A 20040630

Priority

US 2004021211 W 20040630

Abstract (en)

[origin: WO2006011882A1] In a trench-gated MOSFET (840) including an epitaxial layer (842) over a substrate (841) of like conductivity and trenches containing thick bottom oxide (846), sidewall gate oxide (850), and conductive gates (844), body regions (843) of the complementary conductivity are shallower than the gates (844), and clamp regions (853) are deeper and more heavily doped than the body regions but shallower than the trenches. Zener junctions clamp a drain-source voltage lower than the FPI breakdown of body junctions near the trenches, but the zener junctions, being shallower than the trenches, avoid undue degradation of the maximum drain-source voltage. The epitaxial layer (842) may have a dopant concentration that increases step-wise or continuously with depth. Chained implants of the body (843) and clamp regions (853) permit accurate control of dopant concentrations and of junction depth. Alternative fabrication processes permit implantation of the body (843) and clamp regions (853) before gate bus (852) formation or through the gate bus (852) after gate bus formation.

IPC 8 full level

H10B 12/00 (2023.01); **H01L 29/06** (2006.01); **H01L 29/76** (2006.01); **H01L 29/94** (2006.01); **H01L 31/119** (2006.01)

CPC (source: EP US)

H01L 29/0878 (2013.01 - EP US); **H01L 29/66734** (2013.01 - EP); **H01L 29/7808** (2013.01 - EP); **H01L 29/7813** (2013.01 - EP US); H01L 29/0696 (2013.01 - EP); H01L 29/42368 (2013.01 - EP)

Cited by

EP4163981A1; EP3664136A1

Designated contracting state (EPC)

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

DOCDB simple family (publication)

WO 2006011882 A1 20060202; CN 100517719 C 20090722; CN 101002323 A 20070718; EP 1761953 A1 20070314; EP 1761953 A4 20090225; JP 2008505480 A 20080221

DOCDB simple family (application)

US 2004021211 W 20040630; CN 200480043516 A 20040630; EP 04756535 A 20040630; JP 2007519180 A 20040630