(57) Abstract: Devices, methods, and processes that improve immunity to transient voltages and reduce parasitic impedances. Immunity to unclamped inductive switching events is improved. For example, a trench-gated power MOSFET device having a SiGe source is provided, where the SiGe source reduces parasitic npn transistor gain by reducing hole current in the body or well region, thereby decreasing the likelihood of a latch-up condition. A body tie on this device can also be eliminated to reduce transistor cell size. A trench-gated power MOSFET device having a SiGe body or well region is also provided. A SiGe body reduces hole current when the body diode is turned on, thereby reducing reverse recovery power losses. Device characteristics are also improved. For example, parasitic gate impedance is reduced through the use of a poly SiGe gate, and channel resistance is reduced through the use of a SiGe layer near the device's gate.
Declaration under Rule 4.17:
— of inventorship (Rule 4.17(iv))

Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
22 February 2007

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC: H01L 31/00(2007.01)

USPC: 257/192
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S.: 257/192, 330, 331/412

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 6,255,692 B1 (HUANG) 3 July 2001 (03.07.2001), columns 5-6, figure 1.</td>
<td>1-5</td>
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<td></td>
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<td>11-14</td>
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<td></td>
<td>figure 1K</td>
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<tr>
<td>Y</td>
<td>US 6,709,912 B1 (ANG et al) 23 March 2004 (23.03.2004) column 1, lines 12-54.</td>
<td>11-14</td>
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☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search
24 November 2006 (24.11.2006)

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Date of mailing of the international search report
03 JAN 2007

Authorized officer
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Telephone No. N/A

Form PCT/ISA/210 (second sheet) (April 2005)
Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: SiGe, silicon, germanium, silicon, wide band gap, narrow band gap, source, body, drain, vertical