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(54) **SEMICONDUCTOR DEVICE**

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(57) **ABSTRACT**

We herein describe a power semiconductor device having a semiconductor substrate including an active region and an edge termination region surrounding the active region, an edge termination structure located in the edge termination region of the semiconductor substrate, and a plurality of oxide segments located over the upper surface of the edge termination region of the semiconductor substrate, where the plurality of oxide segments are laterally spaced from each other. The power semiconductor device also includes a charge dissipation layer located over the upper surface of the edge termination region of the semiconductor substrate and the plurality of oxide segments, such that the charge dissipation layer is in contact with the upper surface of the semiconductor substrate only at a plurality of interface regions, where the interface regions comprise regions of the semiconductor substrate located laterally between adjacent oxide segments.