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(54) **SEMICONDUCTOR DEVICE, METHOD FOR
MANUFACTURING THE SAME, AND
ELECTRONIC SYSTEM INCLUDING
SEMICONDUCTOR DEVICE**

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ABSTRACT

A semiconductor device includes a substrate; a stack structure including an interlayer insulating layer and a gate electrode which are alternately stacked on the substrate; a channel layer extending in a direction crossing the substrate through the stack structure; and a gate dielectric layer between the gate electrode and the channel layer, the gate dielectric layer including a tunneling layer, a charge storage layer, and a blocking layer sequentially on the channel layer, wherein the tunneling layer includes a carbon-containing layer including carbon, and the tunneling layer is positioned closer to the channel layer than it is to the charge storage layer.

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