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(54) **METHODS AND APPARATUS FOR CONTROLLING SWITCH GATE LOGIC IN A POWER CONVERTER**

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(57) **ABSTRACT**

A cycloconverter configured for use with a power converter is provided herein and comprises a bidirectional switch operable in a first mode of operation when an AC mains voltage is equal to or greater than a predetermined voltage and a second mode of operation when the AC mains voltage is less than the predetermined voltage, such that during zero voltage switching (ZVS) commutations a first Gate of a first pair of Gallium-Nitride (GaN) High Electron Mobility Transistors is on, a second Gate of the first pair of Gallium-Nitride (GaN) High Electron Mobility Transistors is off, and the first Gate and the second Gate of a second pair of Gallium-Nitride (GaN) High Electron Mobility Transistors are off.

