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(12) **United States Patent**  
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(54) **FORWARD CONVERTER WITH SELF-DRIVEN SYNCHRONOUS RECTIFIERS**

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See application file for complete search history.

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(57) **ABSTRACT**

The present invention relates to a forward converter with self-driven synchronous rectifiers, which utilizes a secondary driving winding and a secondary driving circuit to drive the synchronous rectifiers in the secondary power loop. The secondary driving circuit, which is composed of a level shifter and a signal distributor, can shift the voltage waveform across the secondary driving winding by a predetermined level and distribute proper driving signals to the synchronous rectifiers to reduce the rectifier conduction loss. Specially, the channel of the freewheeling synchronous rectifier still can be turned on during the dead interval to further reduce the body diode conduction loss.

**20 Claims, 23 Drawing Sheets**

