High Frequency LLC Resonant Converter with Magnetic Shunt Integrated Planar Transformer

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High Frequency LLC requires a smaller resonant inductance which is usually implemented by transformer leakage inductance. However, this small resonant inductance is difficult to deal with a wide input voltage range. This paper proposes a new method to implement a larger resonant inductance by using a magnetic shunt integrated into planar transformer. The switching frequency can be greatly narrowed by designing a smaller inductance ratio of magnetizing inductance to resonant inductance. Since this method can well deal with a wide input voltage range without adding extra inductor and increasing the size of the transformer, the power density can be improved. The precise leakage inductance calculation method for this transformer and detailed LLC converter design procedure are presented. A 280-380V and 48V-100W half bridge LLC resonant converter with 1 MHz resonant frequency is built to verify the design methodology.