EMI Noise Reduction for PFC Converter with Improved Efficiency and High Frequency Clock
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1. Objective
AC-DC converter improvement
1. EMI noise reduction
   ➔ Frequency modulation
2. Efficiency improvement ➔ SiC-SBD
3. Input LPF size reduction
   ➔ SBD (high clock frequency)
SBD: Schottky Barrier Diode
SiC: Silicon Carbide

2. Background
Problem 1
[Diagram of EMI noise generation with labels: Radiation noise, Conduction noise]
Current flow ➔ EMI noise generation
EMI: Electro-Magnetic Interference

Problem 2
[Diagram of switching loss with labels: Increasing switching loss per unit time]

Goal
• EMI noises reduction for regulation
• Decreasing switching loss

3. Proposed Circuit

4. Noise Spectrum Spread
[Diagram of noise spectrum with labels: Clock frequency modulation, Noise spectrum Spread, Harmonics peak reduction]
In this paper, frequency modulation usage

Without clock modulation
With clock modulation

5. Loss Comparison Results

Conventional Si Power Diode
Recovery current generation at turn off
Fck increase ➔ Switching loss increase

SiC Power Diode
• Recovery current reduction
• High breakdown voltage
• High cost at device level
Total cost down at circuit level!

6. Conclusion
• PFC with frequency modulation
  Fixed frequency ➔ Frequency modulation
  EMI noise reduction by more than 17 dB
  Diode recovery current reduction
  PN-Di ➔ SIC-SBD employment

Reference