

Improved Y-Source Single-Stage Transformerless Micro-Inverter for PV Residential Applications

Y-Source Impedance Network (YSN) is one of the most suitable for providing high voltage gain. It generates a high voltage gain by using a small shoot-through duty cycle, which makes it suitable in applications require a wide range of input voltages such as the Photovoltaic (PV) power plants. However, traditional (YSNs) are unable to boost low voltages in certain applications to the DC-link voltage (about 400V) since it requires a high number of the turns ratio. Higher turns ratio implies higher leakage inductance resulting in higher DC-link voltage spikes. Also, traditional YSNs have high voltage stresses across the components. In this paper, a developed new transformerless Micro-Inverter (MI) is presented that can overcome all the aforementioned drawbacks. The proposed MI has been developed and designed to eliminate both the leakage inductance due to three-winding coupled transformer and leakage current due to using transformerless MI configuration. In addition, the proposed MI reduced the components' stress significantly and increases the converter voltage gain capability in one single-stage. The proposed high boost ratio transformerless MI is analyzed through the PLECS software simulator and implemented in a small scale MI prototype to ensure the results agree with the analysis and simulation results.