The Photovoltaic (PV) systems have been developed through different phases, starting with the centralized PV system to the string technology is proposed to solve some of the drawbacks of the previous approach. Presently, decentralized inverters are being developed at the PV panel power level (known as AC PV Modules). Such new PV systems are becoming more attractive and experts predict it to be the trend for future of solar energy generators. The AC-Module PV system consists of an inverter attached to one PV panel. This integration mode requires that both devices have the same life-span. Although, the available commercialized inverters have a very short life-time (2-3 years) compared to the PV panel life-time, which is about 25 years. It has been states in the literature that the decoupling capacitor (electrolytic type) in the single-phase inverter is the most vulnerable component. Hence, many power decoupling techniques had been proposed to solve this problem by replacing the large electrolytic capacitor with a small film capacitor. In this thesis, in addition to a quick review of these power decoupling techniques, a new three-port micro-inverter with power decoupling capability for AC-Module PV system applications will be presented.

In the proposed, one switch and two diodes are added to the Flyback type topology. The purpose is to detach the decoupling capacitor from the PV panel. So, there are no constraints on the DC voltage and voltage ripple on the capacitor’s terminals. Film capacitor, which has a longer life-time than the electrolytic one, will be used to eliminate the power ripple at the input side. Moreover, the proposed topology solves the problem associated with the leakage inductance by storing the leakage energy in the decoupling capacitor without using additional circuit (RCD, LCDD, or SC clamp).

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The public is welcome to attend.