Fault detection in PV systems is a key factor in maintaining the integrity of any PV system, it is also essential to be able to simulate the PV characteristics and faults through software. In this thesis a comprehensive literature survey of fault detection methods for DC side of a PV system is presented. The disparities in the techniques employed for fault detection are studied. A new method for modeling the PV systems information only from manufacturers datasheet using both the Normal Operating Cell temperature conditions (NOCT) and Standard Operating Test Conditions (STC) conditions is proposed. The input parameters for modeling the system are ISC, VOC, IMPP, VMPP and the temperature coefficients of ISC and VOC for both STC and NOCT conditions. The model is able to analyze the variation of PV parameters such as the ideality factor, Series resistance, thermal voltage and Band gap energy of the PV module with temperature. Finally a novel intelligent method based on Probabilistic Neural Network is proposed for fault detection and classification for PV farm with string inverter technology.