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A Review on Faults Occurring in Converters of PV Systems

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Abstract: In today's scenario, there is large involvement of technological transformations. The solar energy is becoming one of the modern solution towards sustainable energy supply in future. As more and more Solar Photovoltaic systems are getting integrated into the existing grid, there is need for monitoring or supervision of real time data obtained from solar photovoltaic plants, to improve the overall performance of the solar power plant. As local supervision or diagnosis is not possible for the installer, therefore monitoring remotely is essential for every solar power plant.
Keywords: PV system, IGBT, MOSFET

I. INTRODUCTION

With advancing of technology in various fields like consumer, residential, military, industrial as well as medical etc. As there is advancing in technology mostly every system need electric energy. Such electric energy can be generated through photovoltaic solar panels. In this advancing technology era every system is interconnected via internet or interconnected node based wireless sensing devices. The new concept is spreading widely that is IoT Internet of Things. Recently, it is use for the field of consumer electronics and appliances but also in other various fields such as a smart city, healthcare, smart home, smart car, energy system as well as industrial security**.** At present, the solar photovoltaic (PV) energy is one of the growing renewable energy sources. Power generation from Solar Photovoltaic plants is not fix it varies due to changes in solar irradiance, temperature and other factors. Therefor remote monitoring is essential. For developing remote monitoring system and fault detection in solar photovoltaic power plant in which the converters used. In the photovoltaic systems the converters are mainly affected due to electrical stress, it means the electronic component like semiconductor switches like MOSFET,IGBT works under the electrical stress. The converters must do their job properly, which is the one of the need of photovoltaic systems. So faults occur in the system should be avoided by keeping monitoring and diagnosing the system properly and maintain a record of PV system performance.

II. LITERATURE SURVEY

In reference [1] proposes boost converter with two phase shift switches, which has same characteristics as conventional but it has twice current ripple frequency. In the boost converter there are two phase shifting switches used, which are in parallel. This boost converter act same as conventional single switch converter, actual system bandwidth and the inductors frequency increases which will give freeness to select switching devices like IGBT or MOSFETS.

As observed that failure modes, due to thermal fatigue, are the solder cracks between the copper base plate as well as the direct copper bonding (DCB) substrate and bond wire lift-off [2]. IGBT modules are useful, nowadays, as basic switches for medium and high power inverters for traction applications. Here in this reference presents an analysis method based on the boundary element method (BEM) to investigate thermal behaviour of high power semiconductor packages subjected to power cycling loads.

The reference [3] deals with the intrinsic failure mechanisms and reliability models of state-of-the-art MOSFETs, physical behaviour of the critical failure mechanisms in microelectronic devices are significantly grown. Here in this reference prediction methods and presents an approach for accurate system reliability modelling in the competing mechanisms described which helps to predict system credibility and failure rate.

The major faults occurred in the PV systems as they are unpredictable so continuous monitoring should be done. The PSIM circuit based model is for shadowing fault and the malfunctioning of the system to measure overall system performance and it also useful for I-V and P-V characteristics as the PV panels surface temperature vary due to irradiation of the sunlight [4]. The electrical anomaly and solar cell aging also cause the system performance down. This PSIM simulation software will help for power electronics application such as PV system fault detection.

With the different types of converter which currently useful in the PV systems so that there are mainly discussed boost converter and buck-boost converter [5]. In order to make such converters fault current tolerance done in such a way the current way include

switches passes inductor will help to reduce sharp fault current. In the converters while charging time there will be conduction loss occurs that is in diode, IGBT or MOSFET, input power.

The fault occurred in the PV systems and using statistical signal processing and MATLAB simulation. In this paper there are methods which are visual, thermal and electrical analysis based. The maximum power point tracking algorithm is there for to track the maximum power which is developed in the PV panel. In electrical fault occur due to miss soldering of electronic component, shirt circuit in bus, component failure [6]. They are hardware related it should be avoided by proper unit testing while making circuit.

The fault occur in the open transistor for isolation of open transistor fault and the voltage – source inverter feed backing method. About transistor faults are observed highly as a signal based. The output of the transistor can be helpful for monitoring or diagnosis purpose [7]. The diagnosis method may be based on the variation or elevation of dc component, by putting threshold values so electronic component malfunctioning can be determined. The fourier transform can be used for to find the actual and commanded current space vector in the reference band method.

The faults caused in electronic components, in this paper the artificial intelligence also used for the fault detection purpose, and also the physical damage of the electronic component will also lead the system performance degradation [8]. This paper gives information of the fault isolation scheme, A performance laboratory set up done via MATLAB simulation software, the main focus is on faulty sensor and its components.

To make sure increasing the current rating of the semiconductor switches like BJT, MOSFET, IGBT paralleling is unavoidable.

The snubbers must be design to improve the parallel performance of the high current semiconductor switches [9]. The static and the dynamic losses were calculated in the first step of the stress method. For reliability of converter in which IGBT used in parallel so balance current should be flow from them. Generally IGBT's used in power electronics for high power gain than the MOSFET, due to continuous switching the stress will be on IGBT. If IGBT gets busted in between runtime such moment will cause converter failure. Many things must be considered while using such switching semiconductor devices in parallel like switching frequency, current and voltage as well as power dissipation.

As many peoples learn or use electronic devices in the two ways like first as per the electronic component cost. Second way is as per electronic device safety margin they select it. In this paper the reliability analysis follows the military handbook guidelines that is Mil-Hdbk 217 with the help of commercial software package, that minimizes greatly computational load [10].

So many circuits like boost converters, snubber circuit are analyzed and the how they behaves in considering the stress factor of the circuits components. If there are more complexity or complicated circuits they can be analyzed by Relex evaluation software.

In which the system failure rate and the system performance can be determined. The boost converters which are there in photovoltaic systems the prime data needed to calculate reliability is power dissipated by the switching semiconductor devices like MOSFET, IGBT, the voltage stress, the current stress.

III.CONCLUSIONS

After review from the above-mentioned sources, it seems that many PV systems deployed at various regions have their own need for fault supervision and diagnosis. Such faults might be caused due to environmental that is short circuit cause due to rain, also thermal faults due to high temperature, aging of PV Panel, electrical fault caused by component failure like diode, IGBT, load. In order to avoid such fault they must be monitored and avoided by using signal conditioning, maintaining the I-V, P-V characteristics database to predict system future abnormal behaviour. This will improve system performance as well as reliability.

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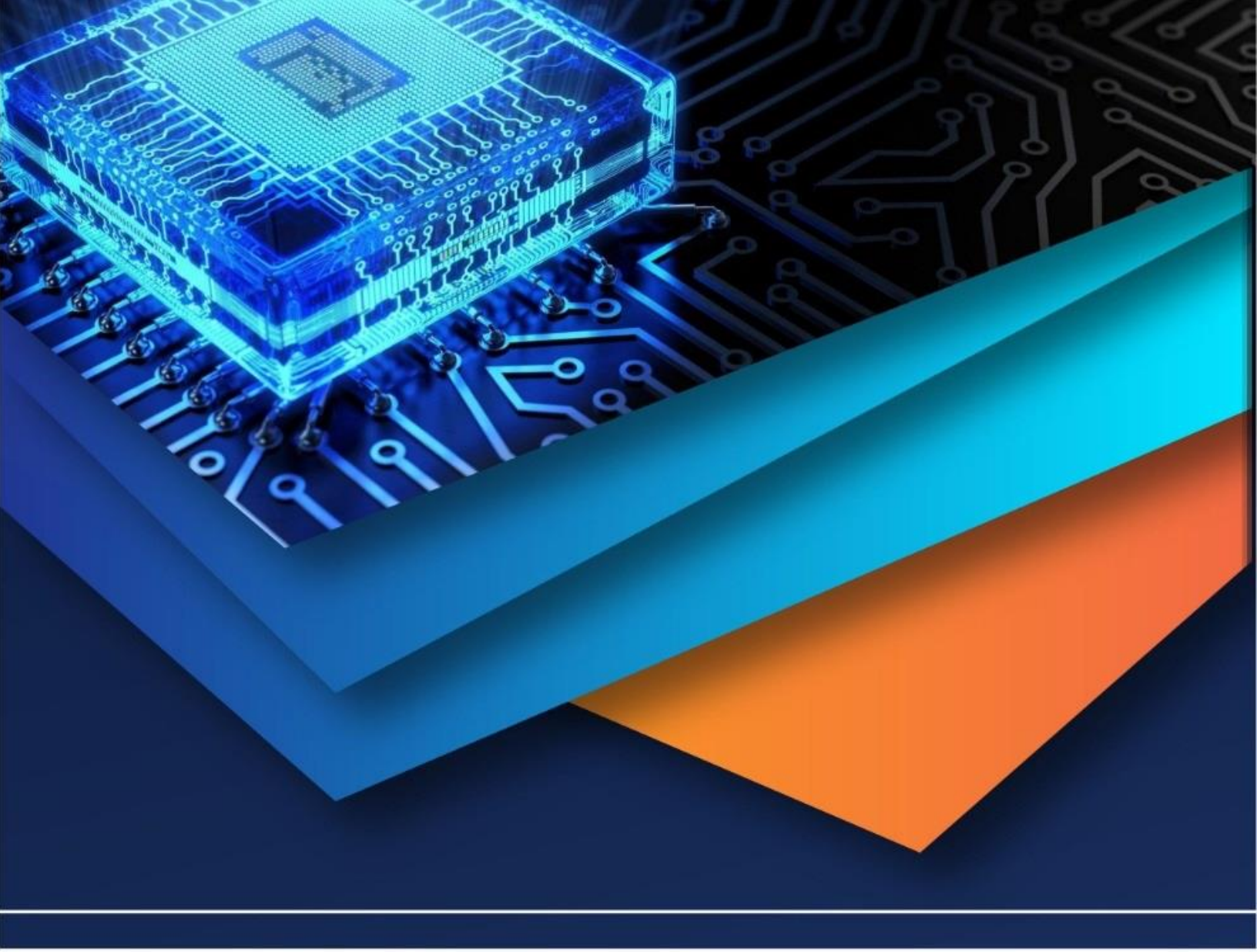

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