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Optimization and Realization of a Low-Cost Data Logger

DJERROUD Salima* , BOUDGHENE STAMBOULI Amine

University of Sciences and Technology of Oran (USTOMB) El M'nouar, 31024, B.P. 1505, Oran, Algeria

Abstract

The need often arises for building a low-cost system for characterizing solar module. The circuit presented in this paper may be classified as a low-cost datalogger for characterizing solar module. The basic idea to reduce the number of components is to use a software solution. So, the use of a μC has been taken into consideration when designing the circuit.
Two important points are discussed in the context of this work. The first section looks at the development of an automatic characterization of PV module based on a microcontroller (μC 16F877A). We present in the second part a practical evaluation of the electrical performance of a solar module with amorphous silicon a-Si: H hybrid (thin film inorganic / organic substrate) in real-time operating conditions, facing south with an angle of 38 ° which is the optimum orientation for the city of Oran (Algeria).
This work presents a practical approach to the characterization of a PV energy system, and gives an idea of the critical points where the design must be carefully optimized.

Keywords: *Automatic measure, Amorphous silicon, PV hybrid module, Characterization, Thin film, Electrical performance.*

1. Introduction

The quality of life and safeness of the present and future generations are strongly intertwined with the availability of energy sources and the sustainability of the energy infrastructure. Energy consumption in developed countries grows at a rate of approximately 1% per year, and that of developing countries, 5% per year [1, 2]. Present reserves of oil and natural gas can only cover consumption at this rate for the next 50 years in the case of oil, and for the next 70 in the case of natural gas. Therefore, one of the fundamental priorities for a country such as Algeria is to use several RE sources and environmentally friendly energy conversion technologies. Algeria plays a very important role in world energy markets, both as a significant hydrocarbons producer and exporter, as well as a key participant in the renewable energy market. Due to its geographical location, Algeria holds one of the highest solar reservoirs in the world.

2. Solar cells in thin films

2.1. The hydrogenated amorphous silicon (a-Si:H)

Note The PV industry is concentrated to near 99% using silicon as base material [3]. Currently, the cost of silicon in the development of a PV panel can reach 50% of total costs, it is clear that reducing the cost of the module through reducing the cost of developing the substrate the most accessible for industry is to reduce the thickness of silicon Polack, while using cheap substrates [4].
At its first introduction in the early '60s, it was not usable because it contained many defects that were limiting performance. After ten years, it was found that the use of a plasma of silane (SiH_4) for the deposit of a-Si: H allowed to obtain a material or 99.9% of the defects was saturated (passivated) by hydrogen [5]. From that time, research on hydrogenated amorphous silicon has intensified, particularly in the field of photovoltaic solar cells in thin layers. That popularity was mainly due to the fact that these films have a coefficient of absorption of sunlight by several orders of magnitude higher than that of crystalline silicon and are often produced directly from the gas phase. Thus, a PV module in

* Tel./ Fax: +21341422981/+21341420681
E-mail: Salima_djerroud@hotmail.com

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