# MOSFET Remaining Useful Life Prediction Using a CNN Framework

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**Abstract**

Power MOSFETs (Metal Oxide Field Effect Transistors) are a certain type of semiconductor components widely used in power conversion devices, charging systems, automotive electronics and other fields and applications. The MOSFETs examined were aged under thermal overstress in a controlled experiment, where accelerated aging resulted in continuous performance degradation measurements. Due to MOSFETs wide applicability, there is a growing demand to predict the Time-to-Failure (TTF) which allows for early replacement of appropriate component(s) before failure actually occurs. To address this problem, efficient prediction tools for remaining useful life are essential. Based on performance degradation, signals can be divided into several stages, while the wavelet transform provides time-frequency spectrum characteristics. An algorithm based on a Convolutional Neural Network (CNN) with time-frequency spectrum characteristics is used to predict performance degradation. The remaining useful life can then be determined based on the degradation state derived from the CNN model. A dataset from the NASA Ames Prognostics Data Repository was used for validation purposes to predict the resistance, current and voltage from different tests applied to MOSFETs. We used Matlab® to obtain graphical representation of degradation signals where the threshold is selected in accordance with the current.

**Keywords:** remaining useful life; MOSFET; time-to-failure; machine learning; convolutional neural network.