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An improved thermal network model of the IGBT module for wind power converters considering the effects of base plate solder fatigue

Li, H.¹; Hu, Y.G.¹; Liu, S.Q.²; Li, Y.¹; Liao, X.L.¹; Liu, Z.X.³

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Abstract: This study presents an improved thermal network model of the IGBT module that considers the effects of base plate solder fatigue on the junction temperature of the said module used in wind power converters. First, the coupling thermal structure 3D finite element model of the IGBT module is established based on the structure and material parameters of the module used in the wind power converters of a doubly fed induction generator. The junction temperature of the module is also investigated at different thermal desquamating degrees of the base plate solder. Second, the thermal resistance parameters are determined at different desquamating degrees, and the improved thermal network model that considers the effects of base plate solder fatigue is established. Finally, the two results of the calculation of the junction temperature are compared in different fatigue stages through the improved thermal network model and the 3D finite element model, which testify to the effectiveness of the improved thermal network model.

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Main heading: Finite element method

Controlled terms: Asynchronous generators - Insulated gate bipolar transistors (IGBT) - Plates (structural components) - Power converters - Wind power

Uncontrolled terms: 3D finite element model - Doubly fed induction generator (DFIG) - Junction temperatures - Material parameter - Resistance parameters - Solder fatigue - Thermal network models - Thermal structure

Classification code: 408.2 Structural Members and Shapes - 615.8 Wind Power (Before 1993, use code 611) - 705.2.1 AC Generators - 714.2 Semiconductor Devices and Integrated Circuits - 921.6 Numerical Methods

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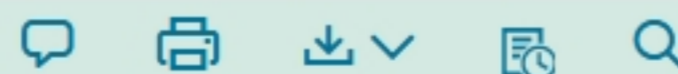
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