ATILA 시뮬레이션을 이용한 스퀘어타입 압전변압기의 펙터연구

Investigation of factors in square-type piezoelectric transformer using ATILA simulation

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Abstract : In this paper, an investigation of factors affecting piezoelectric transformers is presented by ATILA software. These transformers are multi-layer piezoelectric transformers in square shape 28 x 28 mm and operate in first vibration mode for step-down function. The piezoelectric transformers were modeled in 3D-dimension and analyzed using finite element method in ATILA software, a popular software in piezoelectric analysis. Modal and harmonic modules were used in this process. Effective factors to the properties of piezoelectric transformers including different input electrode patterns, directions of polarization, sizes of connective corner, number of layers were examined on the simulated model using input voltage of 20 V and load resistance of 100 Ω. Moreover, thermal analysis was also obtained with conditions of input voltage of 5 V and no-load.

Key Words : Piezoelectric transformer, thermal, step-down

1. Introduction

The model softwares have been used popularly to design and investigate piezoelectric transformers in both 2D and 3D with finite element method (FEM). The many significant design aspects such as shape, electrode pattern, electrode position can only be examined with this simulation. [1-3]. In this study, in order to investigate factors affecting square-type step-down piezoelectric transformers, we simulated these transformers in 3D-dimension using ATILA software.

2. Results and Discussion

The piezoelectric transformer were modelled in square shape with size of 28 x 28 mm and the thickness per one layer of 0.8 mm. The inner electrode was changed from round to square and remained the ratio of input/output area. Moreover, the size of cutting corners were simulated at 1 mm and 2 mm along the edge of transformer; and the layer number was alternated from 3-layer to 5-layer. Output voltage achieved 8.32 V at input voltage of 20 V and load resistance of 100 Ω with the size of 28 x 28 x 2.4 mm.

In this paper, the square-type step-down piezoelectric transformer have been successfully simulated using ATILA software. The electrical properties of piezoeelectric transformer is best in round inner electrode, modified direction of polarization and increasing of layer.

Reference

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