

Output Power Properties of Step-up Piezoelectric Transformer by heat-cold cycling test

Insung Kim, Hyeonkyu Joo, Soonjong Jeong, Minsoo Kim, Jaesung Song and Vietthang Vo*

Korea Electrotechnology Research Institute, University of Science and Technology*

Abstract : The piezoelectric transformer have attracted a lot of interest in recent years because of their potential applications in electronic devices. However, their reliability in practical applications has not been systematically studied. For many piezoelectric materials, the temperature reliability are among the biggest concerns. This paper presents an experimental study of the piezoelectric transformers with the focus on its reliability under varying temperature conditions.

Key Words : Piezoelectric transformer, temperature reliability, heat-cold test,

1. Introduction

In recent years, piezoelectric transformers are mainly applied to the light liquid crystal display (LCD) backlight inverters for notebooks, DC-DC converters, PDA, etc. because piezoelectric transformers have favorable characteristics, such as miniaturized, low-profile, high efficiency and superior power density compared to conventional electromagnetic transformers[1-2]. However, the reliability of piezoelectric transformers has not been widely studied about temperature.

In this study, an experimental study of the piezoelectric transformers present heat-cold test with the focus on its reliability under varying temperature conditions.

2. Experimental

The sintered material was fabricated as Rosen-type piezoelectric transformers with the size of L49mm×W9.0mm×T1.5mm, pasted with Ag, and finally heat treated at 700℃ for 10 min. The piezoelectric transformers were poled at 120℃ for 30min by applying field of 3kV/mm in silicone oil bath. Considering both temperature range and maintenance time as shown in Fig.1. The heat-cold test mainly focuses on testing the piezoelectric material's use adaptability in temperature environment from -50℃ to 150℃.

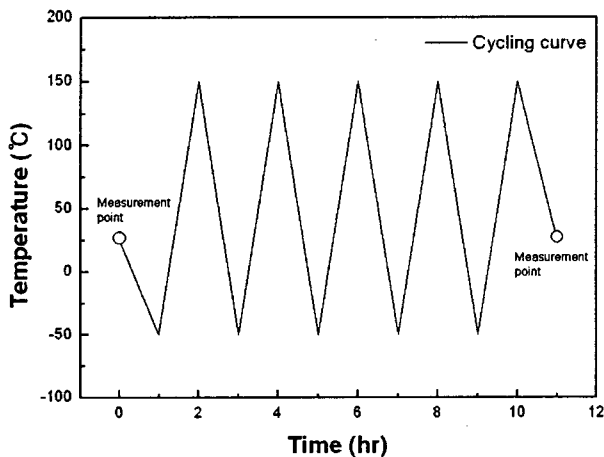


Fig 1. The scheme of experimental at 5 time cycle.

3. Results and Discussion

Figure 2 shows the piezoelectric transformer output voltage according to cycling time and input voltage at 150kΩ matching impedance.

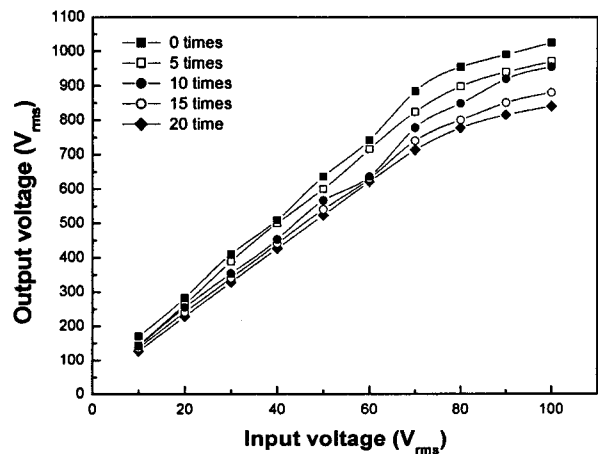


Fig 2. piezoelectric transformer output power according to cycling time and input voltage

The output voltage was gradually decreased after cycling test. And then the more make progress, the more decreased output voltage.

4. Conclusion

The reliability of the piezoelectric transformer was assessed under different temperature conditions, using the heat-cold test. The output voltage of piezoelectric transformer was continuously decreased, when more make progress, the more decreased output voltage.

Reference

- [1] J. Hu, Y. Fuda, M. Katsuno, et al., Jpn. J. Appl. Phys. Vol. 38, p. 3208, 1999.
- [2] K. Sakurai, K. Ohnishi, K. Tomikawa, Jpn. J. Appl. Phys. Vol. 38, p. 5592, 1999.