**Research on thermal performance measurement of LEDs in auto lighting**

Rui Xu,Luxin Ma,Qian Li,Jinyu Yuan

EVERFINE Institute of Optoelectronics,Hangzhou, P.R.China

\*Contact email address:#669 Binkang Road,Hangzhou,China([tech@everfine.cn](mailto:tech@everfine.cn))

**Abstract-**LED has been introduced into auto lighting since 2006, now it is widely used in not only interior lighting, signal lamp and rear lamp, but also headlamp. To meet the auto lighting requirements, the high intensity and high power density LEDs are required for headlamps, e.g. typically 20W and about 1000lm in only several square millimeters luminous area. Besides, the LEDs should be integrated in a small closed shell for waterproof, which could cause high operation temperature to the LEDs due to the heat accumulation and poor dissipation condition. However, the LEDs are very sensitive to heat as we all know. Its luminous output would degrade and color would shift under high temperature, which would have much bad influence for lighting intent and appearance, and even the reliability. That is why LED headlamps generally need better thermal performance of LEDs. And how to evaluate and improve the thermal performance of the LED devices is the key to apply such LEDs in various auto lighting.

Thermal resistance measurement has been proved to be an effective method of non-destructive analysis for single pn-junction package LEDs. While, for high power LEDs and LED modules, there are new challenges due to their more complicated structures and fabricating processes. In this paper, we will study the key techniques of thermal resistance measurement of LEDs used in auto lighting. Further, by analying the transient heating curve through RC modelling method, we can analysis the thermal resistance of each component of the LEDs, and the thermal contact resistance (TCR) of adjacent components as well, to present whole thermal resistance structure (TRS). These quantities are very helpful to indentify the thermal transmission defects and to improve the thermal design of the LEDs. The full paper will give detailed description of the thermal performance measurement method and give a practical example.

***Keywords-****LED auto lights, thermal performance measurement, thermal resistance structure*