Wafer Level Chip Sized Package LED

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ABSTRACT

This treatise offer a simple, fast, reliable, cost-decreasing and less heat-reserving package method of LED – Wafer Level Chip Sized Package [WLCSP LED]. In this method, we made an anti-environment protection layor on LED wafer directly in wafer chip process to protect the grains from oxidation and moisture. And, the lectrode, similar to SMD LED were grown, on the wafer directly. The well-cutted finished WLCSP LED chips are same as the finished package of SMD LED. So the followed packaging processes of LED, i.e. framing, mounting, wire bonding, epoxy encapsulation, are omitted. Omission of epoxy, bonded wire, frame or carrier board can reduce the cost of package and increase the dependability. This finished WLCSP LED chip is a Flip Chip LED, but there is no subtract with it. With bigger electrode as SMD LED, the heat from the contact can conduct out quickly by the shortest distance of bigger area of P, N metal electrode. We had checked the temperature of contact and found it was 20℃~30℃ lower than packaged LED products. Following hereunder, I list 11 different points of package between WLCSP LED and the encapsulation method used now. 1. Chip manufacture procedure: there are 3 added procedures in WLCSPLED. 2. Encapsulation manufacture process: WLCSP LED omit all theprocedures of chip bonding, wire bonding and encapsulation. It means the package factory is unnecessary for WLCSP LED. 3. Heat sinks Junctions: WLCSP LED reduce the junctions from 5 or more in present encapsulation to only one junction. 4. Natural heat sink: WLCSP LED can sink heart by nature air convection. 5. LED dimension: WLCSP LED decrease the smallest dimension of LED from 100μm*500μm*400μm（0402） to 500μm*250μm*60μm（0201）【It is the smallest size SMD can manage presently.】or even smaller. 6. Heat sink organization: While LED is used in high power, it has to set alot of heat sink organizations. For WLCSP LED, sufficient effect can be got by just putting on MPCB only. The cost of heat sink organization is saved. 7. Processing temperature: At present, the processing temperature of LED in pre-heating can not higher than 100℃, and while passing the solder oven the temperature can not over 280℃*3 seconds. The processingcondition of WLCSP LED is same as which used for resistance or IC. 8. Stability and reliability: WLCSP LED has less processing junction, stand for higher processing temperature. For high power dimension the contacted area of electrodes and PCB increase about 36 times, whilethe surroundings condition change it can stand thermal impact. 9. Living life secured: theoretically, the living life of LED is 100 thousand hours, but poor heat sinks drop the living life. WLCSP LED securedthe working temperature under 77℃ the grain is working at low temperature. It extend the living life of white light LED. (For regular LED, the junction temperature is 100-140℃.) 10. Non-yellowing: Due to no epoxy resin is used in WLCSP LED, there is no yellowing and light attenuation problem. 11. Lowest cost: Since packed process is omitted, there are no encapsulation materials and present packed procedure with WLCSP LED. The cost can reduced to the target of lowest level. At present, the cost of WLCSP LED nearly match the target of NT$ 10/W. From the above mentioned 11 main different points, this treatise offer a way to improve and overcome these 11 problems. We can see the larger potentiality and market opportunity of WLCSP LED.

Keywords : WLCSP ; LED ; CHIP ; SMD ; CSP

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