Bond Testing of LEDs

Application Note

LED efficiency has continuously improved with the creation of a white light, in the 1990s, with an intensity of 100lm/W revolutionizing the way in which LEDs can be used.

Typical Failure Modes

Their extreme brightness cause LEDs to generate heat resulting in temperature increasingly becoming an issue. Heat stresses the die attach as well as the wire bond which causes displacement in the bulk of moulding compound. Thermal and mechanical stress weakens the wire bond, eventually breaking it off. With this in mind the manufacturing process needs to be carefully monitored and optimized to guarantee a long life time of the product.

Typical LED device

Test Methods

Nordson DAGE caters for the full range of test methods with the multi-purpose 4000*Plus* bondtester including:

- **Wire pull**
- **Ball shear**
- **Die shear**
- **Low profile die shear**
- **Tweezer pull**
- **Wafer level ball shear**

Nordson DAGE

Wire Pull Test

As wire loops can be very short and low, Nordson DAGE offer, as standard, load cartridges with continuous 360 degree rotation of the hook and a wide range of tools to cater for all geometries. The loop height measurement feature automatically detects the height of the loop and monitors its consistency. The wire breaking force and loop height are saved in the database to enable future analysis.

Ball Shear Test

A ball shear test can be performed with chisel and cavity tools. Nordson DAGE offer shear cartridges with 180 degree rotation of the tool for operator convenience. All shear cartridges have an air bearing touch down sensor to allow smooth landings on the brittle die. The touchdown force is highly sensitive and the step-back repeatability is at ±1μm.

Die Shear Test

GaAs and other LED chip materials are very brittle therefore an absolute parallel alignment of the shear tool to the edges of the die is required otherwise the die will break before the necessary load can be applied to test the interface. The 4000*Plus* bondtester and self aligning shear tools ensures absolute parallel alignment. The operator simply positions the tool to one edge then the self aligning adapter applies the load uniform to the whole width of the die.

Low Profile Die Shear Test

Constant innovation means that dies are getting thinner in order to better transfer the heat to the package however the areas are also becoming larger due to the higher light output required. In order to meet these new testing demands Nordson DAGE has introduced two shear cartridges which provide an excellent step-back repeatability of ±1μm and a work holder which allows co-planarity levelling which together ensure the high repeatability of shearing low profile dies is guaranteed.

Tweezer Pull Test

After the ball bond has been sheared, the wire on the wedge side can be tested using tweezers. The Nordson DAGE parallel closing tweezers can be controlled to apply the closing force very accurately to the interface.

Wafer Level Ball Shear Test

The wafer level test requires a universal wafer chuck, which can be used for wafers up to eight inches in diameter. The unique Nordson DAGE borescope allows a permanent view to the shear tool at approximately 1000x magnification assisting the operator in aligning the shear tool and identifying the failure modes. All images can be captured and saved to the database for reference.

For more information, please contact your Nordson DAGE regional office or speak with your Nordson DAGE representative, all of which are listed on www.nordsondage.com.

Americas
+1 510 683 3930 **Phone**
sales@nordsondage.com **Email**

China
+86 512 6665 2008 **Phone**
sales.ch@nordsondage.com **Email**

Germany
+49 7021 950690 **Phone**
sales.de@nordsondage.com **Email**

Japan
+81 432 995851 **Phone**
sales.jp@nordsondage.com **Email**

South East Asia
+65 655 27533 **Phone**
sales.sg@nordsondage.com **Email**

United Kingdom
+44 1296 317800 **Phone**
globalsales@nordsondage.com **Email**

Nordson DAGE
25 Faraday Road
Rabans Lane Industrial Area
Aylesbury, Buckinghamshire HP19 8RY, UK

+44(0)1296 317800
www.nordsondage.com

Nordson DAGE