Light Emitting Diode

Reducing the Occurrence of Soldering Failures for the Nichia 170 Series LEDs

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The Nichia part numbers NCSW170A, NC2W170A, NCSA170A, NC2A170A, NCSW170B, NC2W170B, NCSA170B, NJSW170C, NCSW170C, NC2W170C, NCSA170C and NC2A170C within this document are merely Nichia's part numbers for those Nichia products and are not related nor bear resemblance to any other company's product that might bear a trademark.

1. Overview

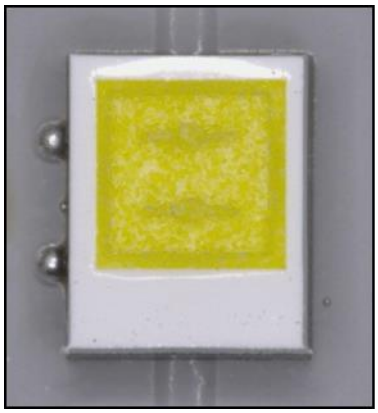
When soldering Nichia 170 Series under reflow, there is possibility soldering problem may happen due to solder-balls, solder-voids and poor-solderability if the conditions such as reflow-profile and PCB are not suitable for the right soldering process and conditions.

It is introduced the effective techniques for improving the soldering problem below.

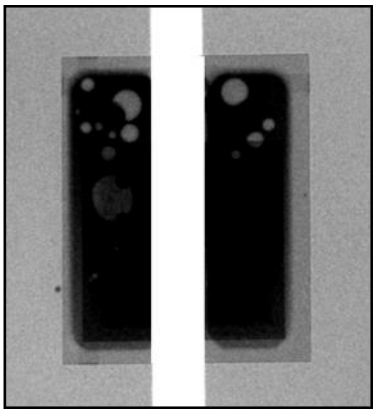
- Applying Non-Solder Mask Defined PCB (NSMD)[1]
- Reflow-Profile Optimization

*Solder-ball means a part of overflowed solder out of soldering pad and being formed solid ball beside the LED outline. (See Figure 1-Left)

*Solder-void means a vacant-space in the soldering joint. (See Figure 1-Right)



Solder-ball



Solder-void

Figure 1. Example of Solder-ball and Solder-void

2. Applicable Part Numbers

This application note applies to the LEDs shown in Table 1.

Table 1. Applicable LED Part Numbers

Part No.	NCSW170A NC2W170A NCSA170A NC2A170A	NCSW170B NC2W170B NCSA170B NJSW170C	NCSW170C NC2W170C NCSA170C NC2A170C

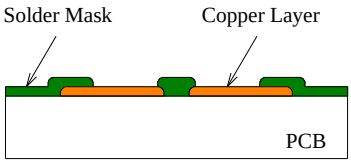
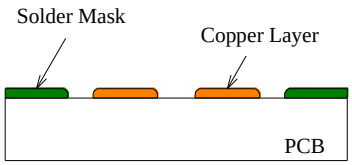
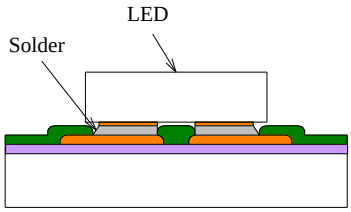
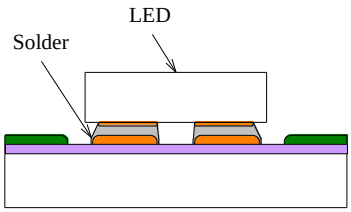
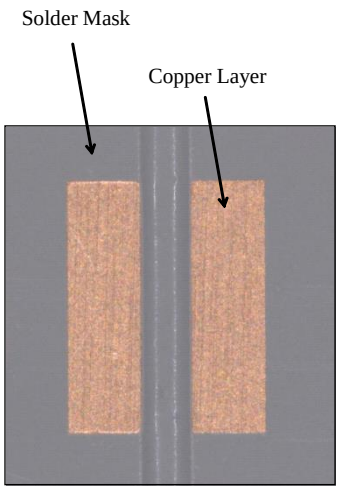
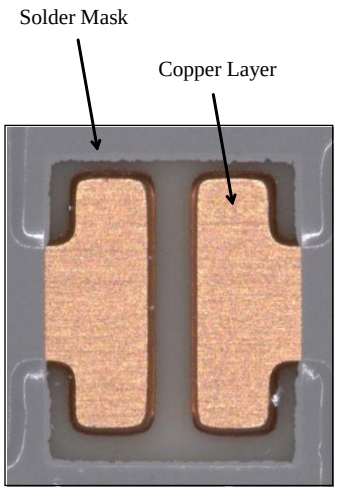
Note:

[1] This PCB type is that Solder-Mask does not cover the copper layer around pads.

3. Applying Non-Solder Mask Defined PCB (NSMD)

Standard PCB is SMD type as flat layer pattern. On the other hand, NSMD type is the one that Solder-Mask does not cover the copper layer around pads. (See Table 2)

Table 2. Copper layer design comparison (SMD vs. NSMD)

	SMD	NSMD
Solder Resist Structure		
PCB Populated with an LED		
Appearance Overview of the Soldering Pad		

It is confirmed the PCB of NSMD type is effective to improve solder-ball and solder-void, applying to Nichia 170 Series LEDs. (See Figure 2, Figure 3)

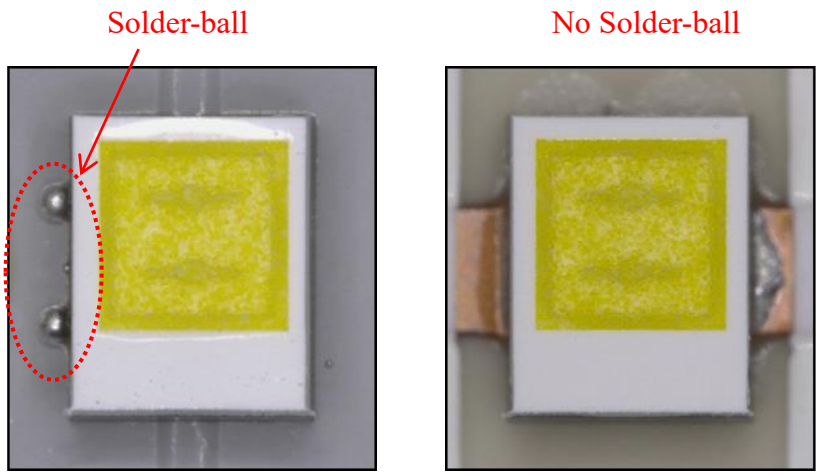


Figure 2. Appearance Observation

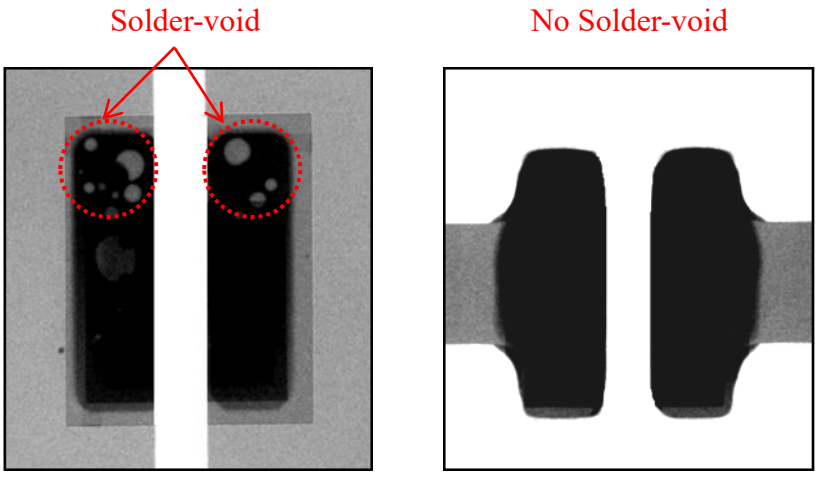


Figure 3. X-ray Observation

4. Reflow-Profile Optimization

When soldering Nichia 170 Series LEDs under reflow, it is important the set-up the profile. There is possibility solder-ball or solder-void happen if the reflow profile is not suitable for the parts combination.

When soldering Nichia 170 Series LEDs under reflow with the paste type: Senju M705 (*SAC305), the reflow profile set up below, referring the customized profile for M705 solder paste, made the good results.

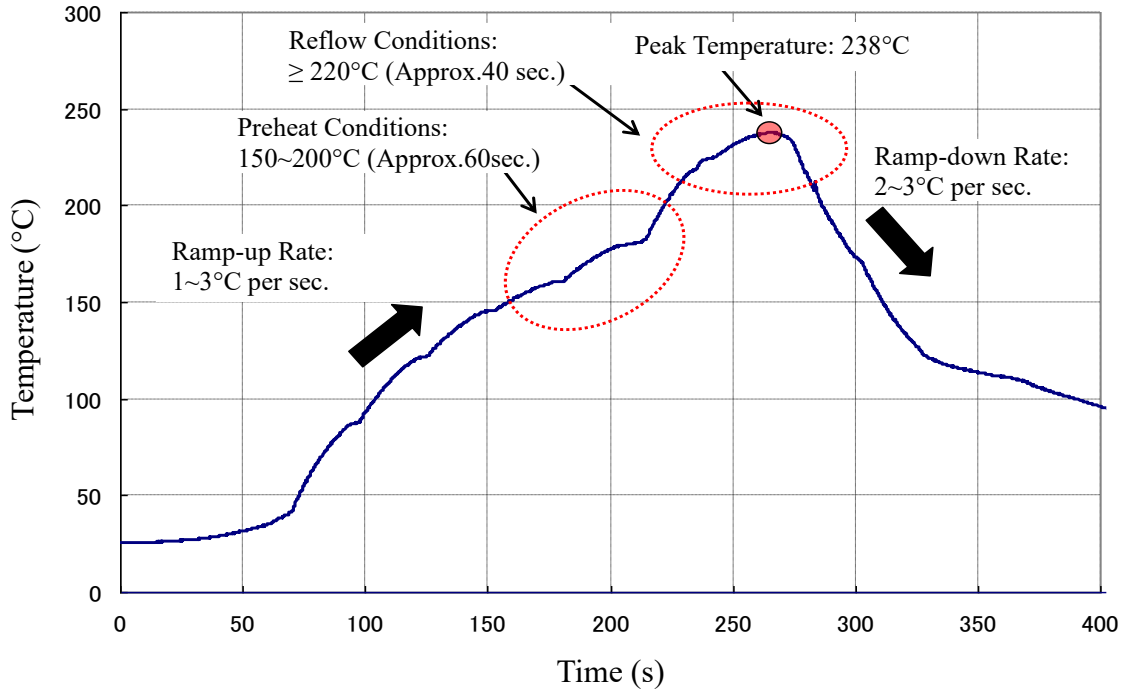


Figure 4. Actual temperature measured profile as target set-up for M705 paste

5. Summary

The introduced items below in this document are influential factors for improving soldering problem.

- Applying Non-Solder Mask Defined PCB (NSMD)
- Reflow-Profile Optimization

Please ensure to implement sufficient evaluations for the combination with PCB, considering appropriate materials such as PCB, solder-paste.

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