

# Mounting Techniques for LEDs with a Lens

## Contents

1. Introduction
2. Mounting Failures in LEDs with a Lens
3. Mounting Techniques
4. Caution
5. Notice

## Mounting Techniques for LEDs with a Lens

### 1. Introduction

As LEDs have recently been miniaturized and highly-functional, higher mounting technologies are necessary for them. It has been difficult to mount such advanced LEDs because of the lenses and the smaller absorption area. Improper mounting will affect the function and the reliability of the performance from the end product. To manufacture high-performance lighting fixtures with high functional LEDs, it is critical to develop the mounting technology.

We have seen many mounting problems in highly-functional LEDs with a lens. This document provides the mounting techniques for such LEDs, exhibiting some mounting failures. Please note that this document recommends a modular moulder to be used.



### 2. Mounting Failures in LEDs with a Lens

Many LEDs with a lens have been developed for higher performance. Such lenses are mostly made of resin; when external stress is applied to the lens, some are susceptible to damage, leading to abnormal optical characteristics, and others are susceptible to wire breakage, leading to abnormal electrical characteristics. Therefore, applying external stress to the lens has to be avoided as much as possible.

Moreover, the contact area of a pick-and-place nozzle and the lens is limited by the presence of the lens, which sometimes causes air leak, resulting in absorption error.

- Problem 1:        Damage to the lens during the mounting process
- Problem 2:        Absorption error due to air leak

An LED lens sometimes sticks to the top cover tape due to the resin's adhesive property, resulting in LED tilting within the cavity.

Also, the center of gravity of an LED with a lens is located higher. When the emboss carrier tape is exposed to an excessive vibration, the LED may be tilted within the cavity.

- Problem 3:        LED tilting within the cavity due to its adhesion to the top cover tape
- Problem 4:        LED tilting within the cavity due to vibration of the emboss carrier tape

Please refer to the following sheets for the countermeasures against Problems 1 to 4.

### 3. Mounting Techniques

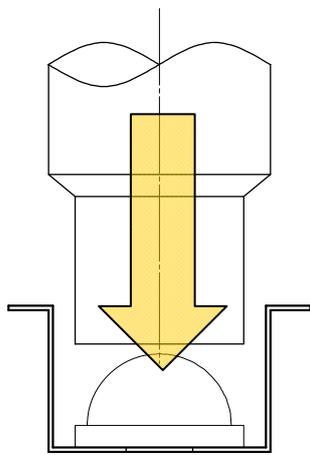
#### 3-1. Problem 1: Damage to the lens during the mounting process

Nichia establishes the optimal absorption method and the optimal cavity shape/size for each LED with a lens.

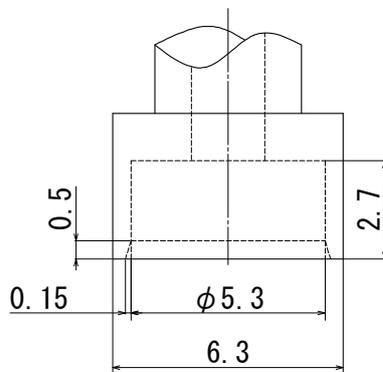
In general, there are two absorption methods; one is the “nozzle insertion system” and the other is the “non-insertion nozzle system.”

##### 3-1-1. Nozzle Insertion System

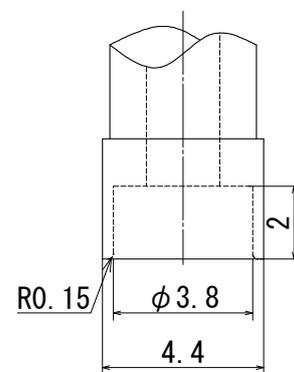
The nozzle insertion system is optimal for the 383/385 series, considering the LED shape/tolerance and the cavity shape/size. The LEDs can be absorbed in a stable condition, when the nozzle is inserted into the cavity and brought close to the lens. Please take care not to insert the nozzle too close to the lens. Therefore, please refer to Nichia’s specifications for the insertion depth.



Inserted into the Cavity



Outline Dimension of the Nozzle  
for NS9x383



Outline Dimension of the Nozzle  
for NFSx385

The pick-and-place nozzle is chamfered so as to form a “C Surface” (a sloped surface) and an “R Surface” (a curved surface), enabling a smooth mounting of the LEDs. Such design of the nozzle can prevent the LEDs from tilting in the cavities.

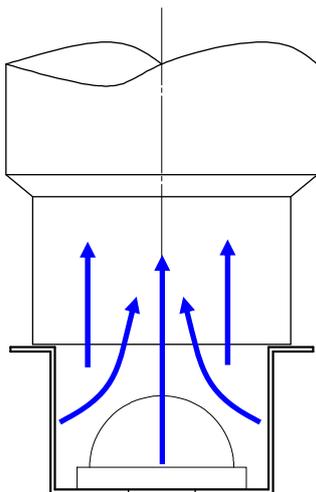
##### 3-1-2. Non-Insertion Nozzle System

When the nozzle insertion system is used for the x19 series, the nozzle may touch the lens and apply excessive stress to it, considering the LED’s shape/tolerance and the dimensional tolerance of the nozzle. If the clearance is left between the nozzle and the lens to avoid the contact with each other, it may be impossible to insert the nozzle into the cavity due to the oversized nozzle.

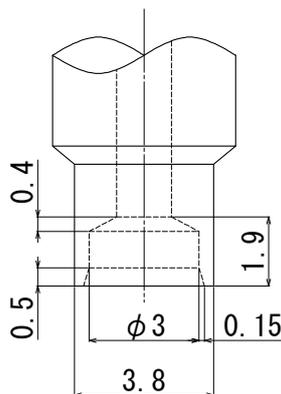
Then, Nichia recommends that the “Non-Insertion Nozzle system” be used for the x19 series. With this system, the nozzle reaches at the top surface of the cavity and absorbs the LEDs.

With the nozzle insertion system, the lens can get damaged due to the insertion pressure of the nozzle. On the other hand, with the non-insertion nozzle system, the nozzle is less likely to apply stress to the lens; only a slight absorption stress is applied to the lens.

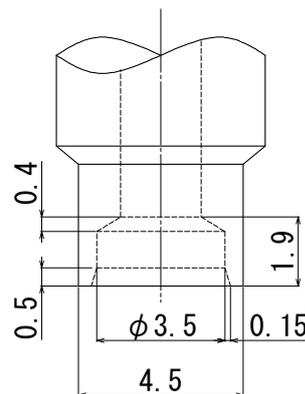
Also, superior durability of the nozzle is achieved because of its sufficient thickness, since it does not have to be inserted into the cavities.



Absorbed by air



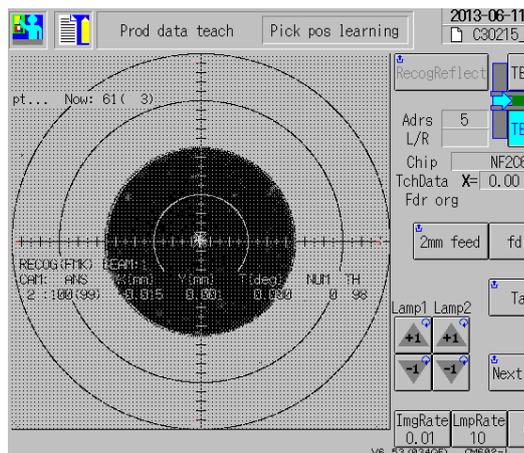
Outline Dimension of the Nozzle  
for x19A series



Outline Dimension of the Nozzle  
for x19B series

### Correction of the Absorption Point

Please adjust the mounter to ensure that the nozzle should absorb the correct point on the LEDs. The absorption point can be corrected with the image recognition unit by aiming at the center of the hole on the bottom surface of the cavity. Please refer to the following pictures for the image recognition unit.



for ref. Panasonic CM Mounter



for ref. Yamaha YS Mounter

### **3-2. Problem 2: Absorption error due to air leak**

By the presence of the lens, the contact area of a pick-and-place nozzle and the lens is limited, which sometimes causes air leak, resulting in absorption error. In such cases, please change the absorption power into a more appropriate value. Judging from Nichia's evaluation results, the LEDs can be properly mounted by adjusting the absorption power from -40 to -90 kpa.

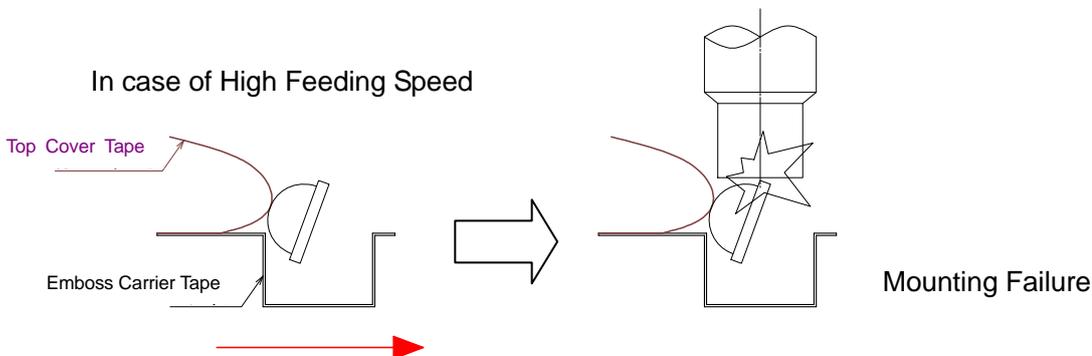
### **3-3. Problem 3: LED tilting within the cavity due to its adhesion to the top cover tape**

LED lenses are made of resin. Therefore, the lenses sometimes adhere to the top cover tape due to the resin's stickiness. When the cover tape is peeled from the carrier tape, the LEDs tilt within their cavities, resulting in mounting failure.

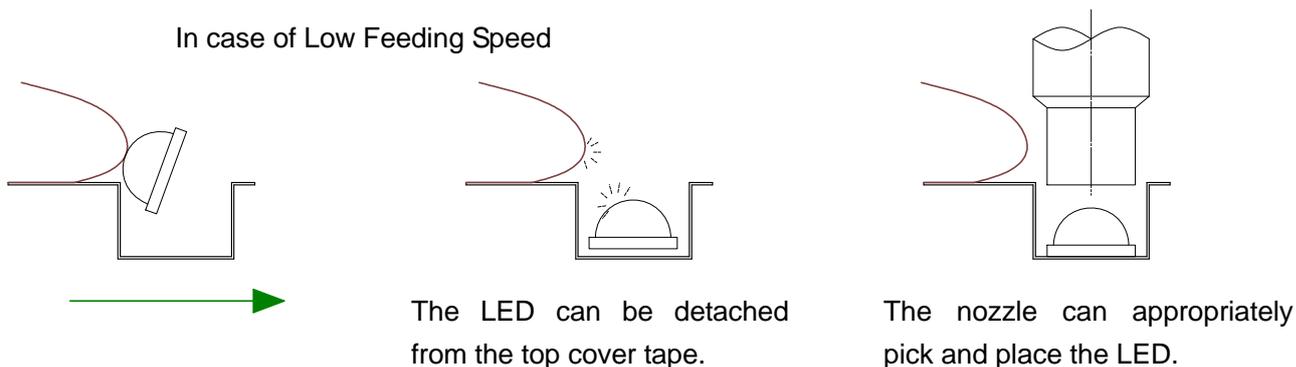
It is impossible to eliminate the stickiness of the lens. Please refer to the following pages for the countermeasures against the LED tilting.

### 3-3-1. Slow down the feeding speed.

When the feeding speed is fast, the pick-and-place nozzle absorbs the LED before the lens is detached from the top cover tape, resulting in mounting failure.



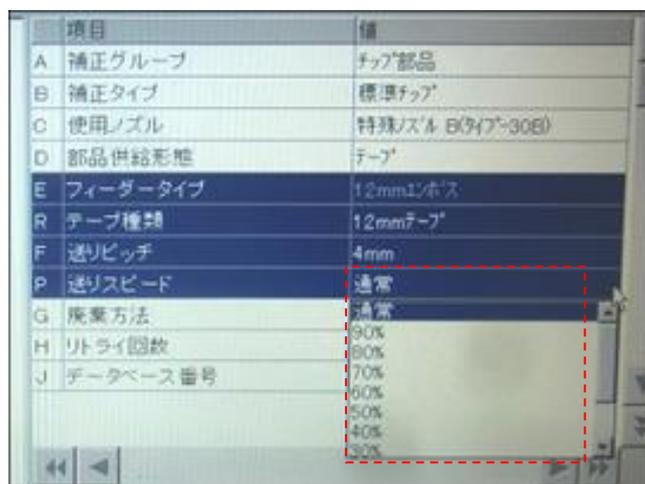
Even when the LED is in contact with the top cover tape; however, by lowering the feeding speed, it can be detached from the tape before absorbed by the nozzle.



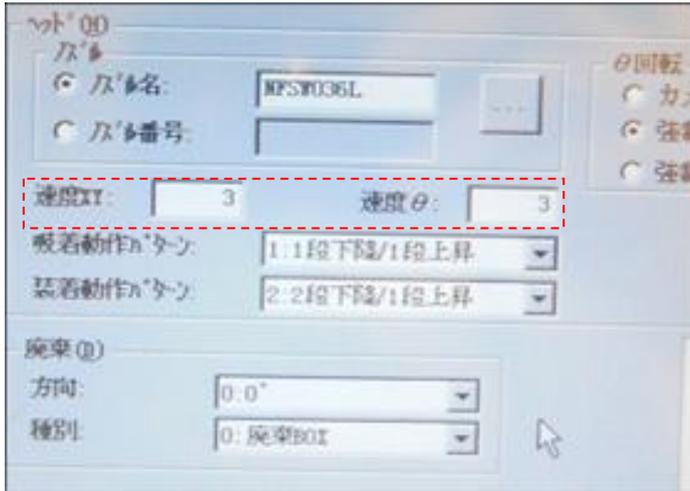
For example, the feeding speed can be changed by the screen as follows:



for ref. Panasonic CM Mounter



for ref. Yamaha YS Mounter

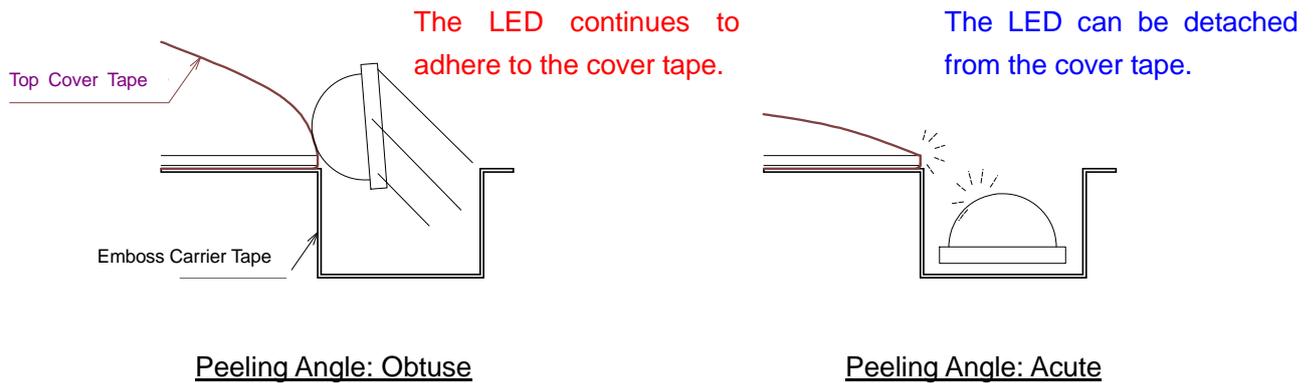


for ref. Panasonic BM Mounter

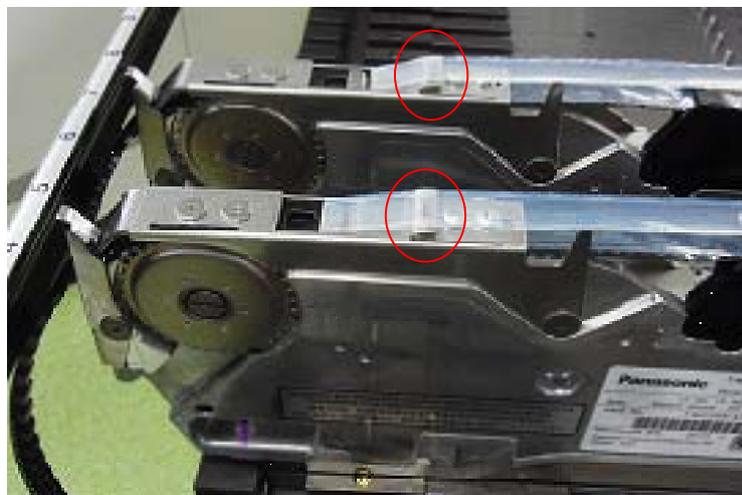
\* It is impossible to change the feeding speed of Panasonic BM Mounter. Instead, the operation speed of the head can be lowered, lengthening the absorption pitch.

### 3-3-2. Change the peeling angle.

As the following figures show, when the top cover tape is peeled off from the emboss carrier tape in an acute angle, the LED can be easily detached from the top cover tape, preventing it from tilting within the cavity.



The peeling angle can be adjusted to its optimal value by some of the mounters as follows:



for ref. Panasonic CM Mounter

### 3-4. Problem 4: LED tilting within the cavity due to vibration of the emboss carrier tape

When an excessive vibration is applied to the emboss carrier tape, LEDs may tilt within the cavities.

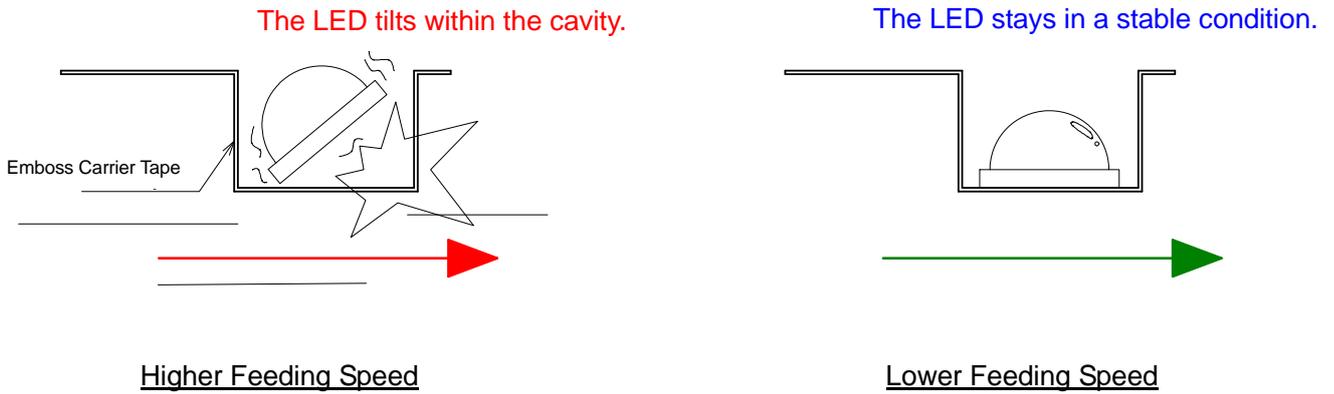
LEDs with a lens are susceptible to vibration, resulting in tilting, since its center of gravity is located higher.

#### 3-4-1. Slow down the feeding speed.

The higher the feeding speed is, the more the vibration affects the LEDs within the cavities. When LEDs tilt within the cavities, please lower the feeding speed to decrease the vibration.

(For ref. Nichia recommends that the feeding speed should be a little slower than high speed.)

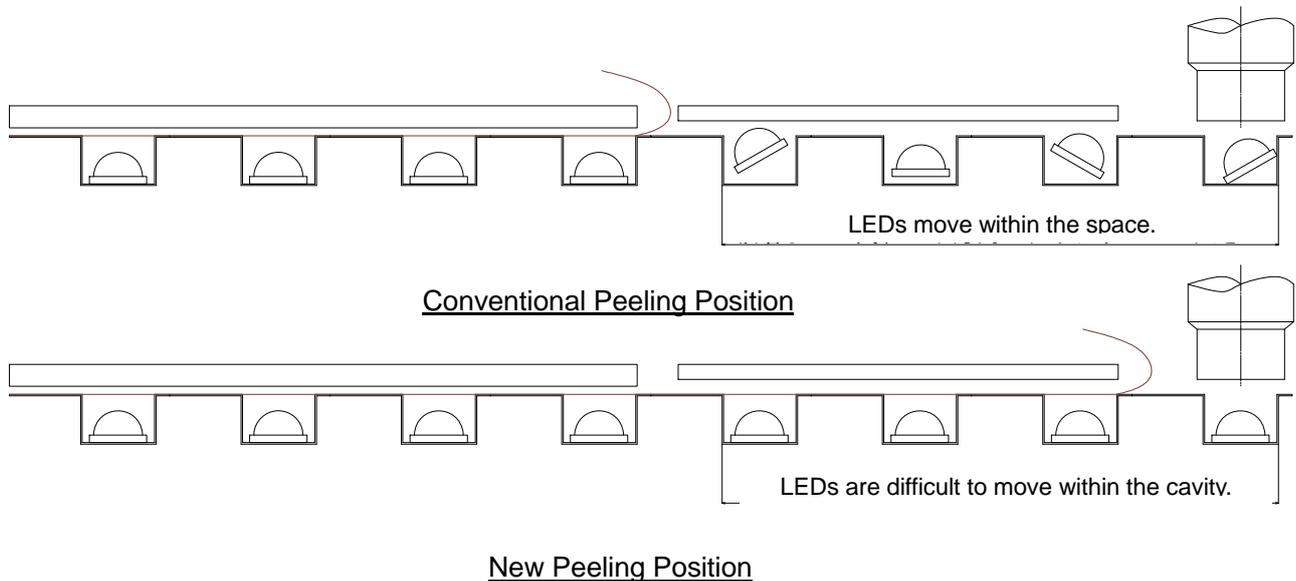
The carrier tape may be vibrated by an air feeder much more than an electric feeder. Please select the feeder depending on the LEDs to ensure that they are properly mounted.

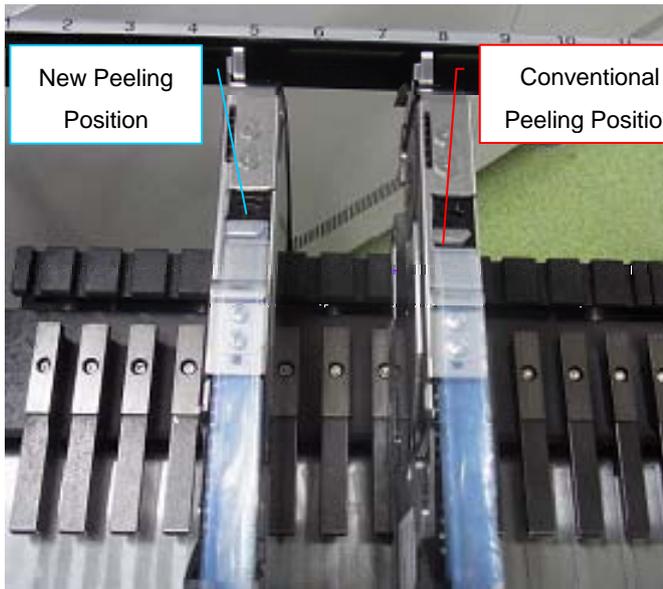


#### 3-4-2. Change the peeling point.

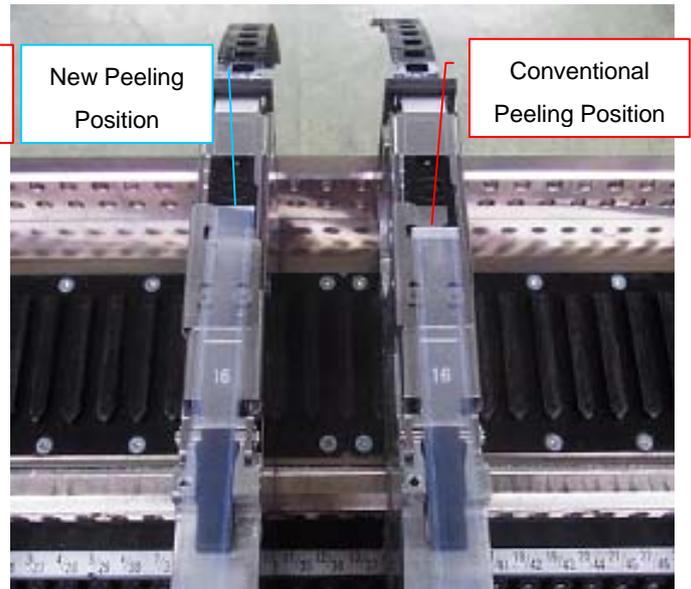
When the top cover tape is peeled off from the emboss carrier tape long before the nozzle comes down to absorb an LED, some of the LEDs move around within the space between the feeder cover and the carrier tape, leading to LED tilting.

Please peel off the cover tape just before the nozzle comes down to absorb an LED. Then, LED's up-and-down movement can be restricted, preventing from LED tilting.

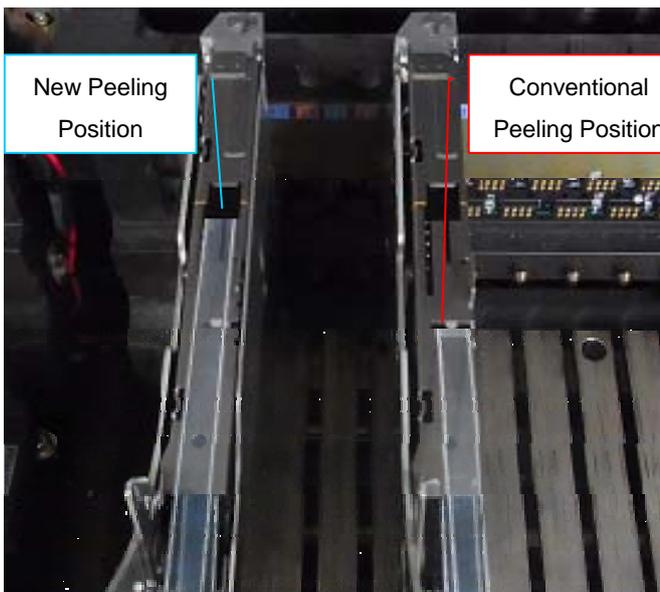




for ref. Panasonic CM Mounter



for ref. Yamaha YS Mounter



for ref. Panasonic BM Mounter

Comparison of the Peeling Positions

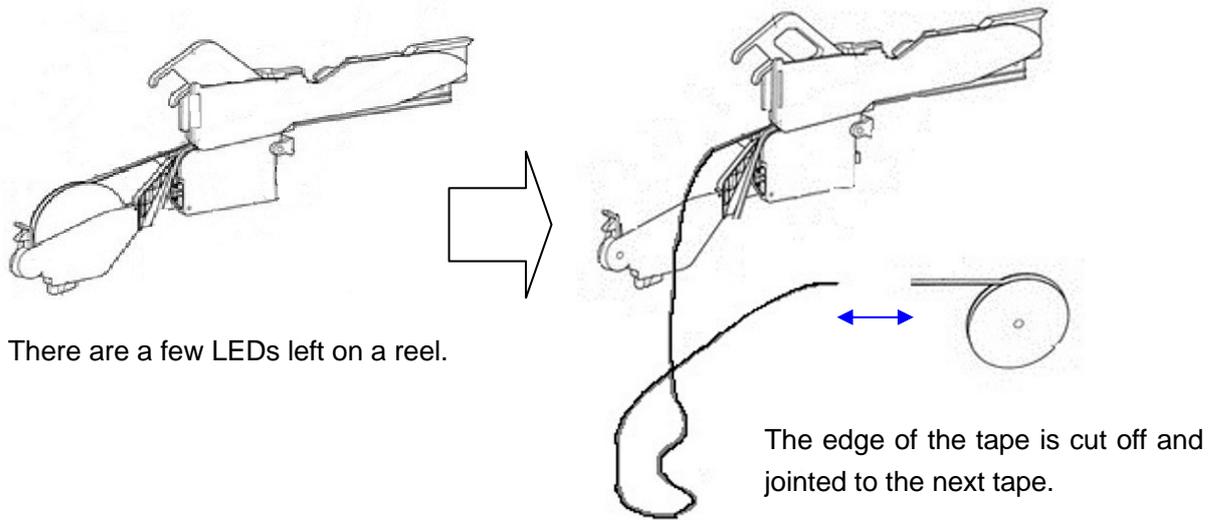
\* Please note that some of the mounters are equipped with a shutter. In such cases, it is impossible to change the peeling position of the top cover tape.

#### 4. Caution

**Please refrain from splicing the tape together.**

“Splicing” stands for the tape joint process while the mounter is operated. When there are a few LEDs left on the reel which is loaded on the mounter, some customers cut off and joint the edge of the tape to the next tape without detaching the feeder from the device. The splicing is to raise the machine utilization without bringing the device to a halt.

The splicing, however, may lead to the LED mounting failure; the LEDs may be tilted within the cavities due to the external stress applied to the carrier tape.



Splicing

#### 5. Notice

Some mounting techniques for LEDs with a lens are described herein; however, they don't fit in with all the mounters. Please select the optimal mounting techniques depending on the LED model and the mounter.

Nichia will aim to continue collecting data concerning the mounting techniques and offering beneficial information to our customers.

When you are concerned about any mounting technique, please contact us.

We would appreciate your cooperation.