COB APPLICATION NOTE
Chip on board For Lighting

COB Application Note
Ver. 2.3 Release Date : 13-Jun.-17
## 0. Introduction

## 1. Component

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# General

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<tr>
<th>Model</th>
<th>LC003D</th>
<th>LC016D</th>
<th>LC040D</th>
</tr>
</thead>
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<tr>
<td>LC006D</td>
<td>LC019D</td>
<td>LC060D</td>
<td></td>
</tr>
<tr>
<td>LC009D</td>
<td>LC026D</td>
<td>LC080D</td>
<td></td>
</tr>
<tr>
<td>LC013D</td>
<td>LC033D</td>
<td></td>
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</tr>
</tbody>
</table>

**Shape**

- **Remark**
  - 13.5 x 13.5 mm Ø9.8 mm
  - 19.0 x 19.0 mm Ø14.5 mm
  - 28.0 x 28.0 mm Ø22.0 mm

# Application

<table>
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</tr>
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</table>

**Bulbs/MR/PAR**
- ○
  - ○

**Down/Spot Light**
- ○
  - ○
  - ○

**High/Low bay**
- ○
1. Component

- **Appearance Features**
  - Efficient LES area over product size
  - Uniform Chip arrangement
  - Concave shaped corner for Screw fixation
  - Aluminum metal substrate

: Metal substrate basically make the low thermal resistance

![Component Diagram]

- Cathode
- Anode
- Cathode Mark
- Anode Mark
- Bonding pad
- The concave shaped corner for mounting COB
### Samsung COB Line-up

- D series is targeting main stream in general lighting and it has leading efficacy.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Model</th>
<th>Wattage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3W</td>
</tr>
<tr>
<td>COB D-series</td>
<td>CRI 70+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CRI 80+</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>CRI 90+</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>CRI 95+</td>
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<tr>
<td></td>
<td>Vivid</td>
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</tr>
<tr>
<td>Gen.2</td>
<td>CRI 70+</td>
<td>●</td>
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<tr>
<td></td>
<td>CRI 80+</td>
<td>●</td>
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<tr>
<td></td>
<td>CRI 90+</td>
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</tr>
<tr>
<td>Gen.1</td>
<td>CRI 70+</td>
<td>●</td>
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<tr>
<td></td>
<td>CRI 80+</td>
<td>●</td>
</tr>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Wattage</th>
<th>3W</th>
<th>6W</th>
<th>9W</th>
<th>13W</th>
<th>16W</th>
<th>19W</th>
<th>26W</th>
<th>33W</th>
<th>40W</th>
<th>60W</th>
<th>80W</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES 9.8mm</td>
<td>(13.5x13.5mm)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.5mm</td>
<td>(19x19mm)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.0mm</td>
<td>(28x28mm)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.1.1 Package Circuit & Dimension LC003D

- **Package**

- **Dimension**

  - **Top View**

  - **Side View**

- **Circuit Array**

  - Anode
  - Cathode

- **12S x 1P**
1.1.1 Package Circuit & Dimension_LC006D

- **Package**

- **Dimension**

- **Circuit Array**

  - Anode
  - Cathode

  12S x 2P
1.1.1 Package Circuit & Dimension_LC009D

- **Package**

- **Dimension**

- **Circuit Array**

  Anode  
  Cathode  

  12S x 3P
1.1.1 Package Circuit & Dimension LC013D

- **Package**

- **Dimension**

**<Top View>**

**<Side View>**

- **Circuit Array**

Anode

Cathode

12S x 4P
1.1.1 Package Circuit & Dimension LC016D

- Package

- Dimension

- Circuit Array

12S x 5P

Anode

Cathode

<Top View>

<Side View>
1.1.1 Package Circuit & Dimension_LC019D

- **Package**

- **Dimension**

  <Top View>

  ![Top View Diagram]

  - Anode
  - Cathode
  - 12S x 6P

  <Side View>

  ![Side View Diagram]
1.1.1 Package Circuit & Dimension_LC026D

Package

Dimension

Circuit Array

12S x 8P

Anode

Cathode

<Top View>

<Side View>
1.1.1 Package Circuit & Dimension\_LC033D

- **Package**

- **Dimension**

  <Top View>

  ![Top View Diagram]

  <Side View>

  ![Side View Diagram]

- **Circuit Array**

  Anode

  ![Circuit Array Diagram]

  12S x 10P

  Cathode
1.1.1 Package Circuit & Dimension_LC040D

■ Package

■ Dimension

■ Circuit Array

<Top View>

<Side View>
1.1.1 Package Circuit & Dimension LC060D

- **Package**

- **Dimension**

- **Circuit Array**
  - 18S x 12P
  - Anode
  - Cathode

**Top View**

**Side View**

24.5±0.3
22±0.3
0.5±0.2
1.1.1 Package Circuit & Dimension \_LC080D

- **Package**

- **Dimension**

  **<Top View>**

- **Circuit Array**

  - Anode
  - Cathode

  **18S x 18P**

  **<Side View>**

  - 24.5±0.3
  - 22±0.3
  - 1.0±0.2
### 1.1.2 Laser-marking guide _D-series Gen.1_

#### Format _D-series Gen.1_

<table>
<thead>
<tr>
<th>1313 Size</th>
<th>1919 Size</th>
<th>2828 Size</th>
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<tbody>
<tr>
<td>ex) 3W Ra80 3000K</td>
<td>ex) 26W Ra80 3000K</td>
<td>ex) 40W Ra80 3000K</td>
</tr>
</tbody>
</table>

#### Information _D-series Gen.1_

1. **LC003D**
   - 1
   - 80
   - 30
   - 3W COB
   - Gen1
   - Ra80
   - 3000K

2. LOT No. of Inner-code

3. “SAMSUNG” should be printed by Samsung One Font

※ The detail dimension of font position and size are not exactly defined.
1.1.2 Laser-marking guide_D-series Gen.2

**Format _ D-series Gen.2**

<table>
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<th>1313 Size</th>
<th>1919 Size</th>
<th>2828 Size</th>
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<td>ex) 40W Ra80 3000K</td>
</tr>
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</table>

**Information_ D-series Gen.2**

1. **LC003D** 2 80 30
   3W COB Gen2 Ra80 3000K

2. LOT No. of Inner-code

3. “SAMSUNG” should be printed by Samsung One Font

※ The detail dimension of font position and size are not exactly defined.
### Thermal characteristics

#### TJ & TC point
- **TJ point**: Junction temperature of chip (Chip)
  : Generally, this temperature couldn’t measure.
- **TC point**: Case temperature of PCB (COB package).
  : Generally, this temperature could measure by thermocouple.

#### Recommended TC point
- **TC point**: One of both pad in the COB package (below image).
  ※ **TS point** is soldering point under SMT PKG. However, COB isn’t SMT structure.
  So, **TS and TC** is same meaning in COB.
Handling Guide

- User have not to touch the lighting Emitting Surface (LES) in any cases.

▶ Tools

- White Ceramic tweezer
- Vacuum tweezer
- Sharped-tip Tweezer

▶ Pick-up

- Softly handling when use white Ceramic tweezer
- Use vacuum tweezer case (have to keep clean vacuum pad side)
- DO NOT allow @ LES side

※ This recommened is provided for informational purpose only and is not a warranty or a specification.
2. Handling Guide

■ Particle on COB

Samsung’s management for “Particle”

→ Samsung COB is managed below target for quality.

• Point particle : Diameter ≥ 1mm
• Line particle : Length ≥ 1mm, Width ≥ 0.15mm

▪ Recommended method for particle removal

If user want to remove “Particle”,

→ User should use blower.

※ This recommended is provided for informational purpose only and is not a warranty or a specification.
2. Handling Guide

- Contamination and cleaning

In the production process of luminaire, COB can be contaminated by an unexpected contaminant.

- Recommended method for cleaning

  The organic material like as solder flux have to be cleaned out by using the tip of cotton swap soaked isopropyl alcohol(IPA).

  ※ This device should not be used in any type of fluid such as water, oil, organic solvent, etc.

※ This recommened is provided for informational purpose only and is not a warranty or a specification.
2. Handling Guide

## Handling Guide (Document)

### Environment of Working place

The working area for assembly luminaire is recommended to be maintained clean for preventing any contamination and keeping workers’ safety. If all working area cannot be maintained clean, at least the space for assembly have to be kept clean and lower humidity in air.

### Handling PKGs

1. Users have not to touch the lighting emitting surface (LES) in any cases.

   ![At LES (Lighting Emitting Surface), the resin and phosphor cannot protect the bonding wire from deformation or disconnection by an external force](image)

2. When handling with tweezers user have to grip the thermo plastic (white mold).

3. Users have to wear the anti-static gloves or anti-static wrist band.

4. When handling COB, user have to use the anti-static tweezers.

   (Especially, a sharpened-tip of the tweezers would have high possibility of giving a physical defect to CSP)

   ![The sharp tip may physically damage the resin of Phosphor Resin or wall.](image)

5. When switching on COB with an electrical power supplier, an unexpected or abrupt current should bring about EOS failure in COB. This may also bring about the failure in use or the decrease of life time of products. Please discharge the stored voltage of the power supplier.
2. Handling Guide

■ Handling Guide (Document)

- **Chemical compatibility**
  During manufacturing luminaire, the many chemicals could attack and contaminate packages. It is necessary to avoid the contaminants and chemicals in manufacturing process and operation. And we are providing the guideline for chemicals and relevant failure mode. (Refer to chemical guideline).

- **Storage**
  If the LEDs are to be stored for 3 months or more after being shipped from Samsung Electronics, they should be packed by a sealed container with nitrogen gas. (Shelf life of sealed bags: 12 months, temp. ~40 °C, ~90 %RH)

  - After sealed bag is to be opened and, COB have to be followed the below guide.
    a. COB should be mounted within 672 hours (28 days) at an assembly line with a condition of no more than 30 °C / 60%RH
    b. COB should be stored at <10 %RH

  - Repack unused products with anti-moisture packing, fold to close any opening and then store in a dry place.

  - If moisture sensitivity indicator is >60 % at 23±5 °C, the recovery work should be carried out at the proper condition. In that case, COB should be baked at 60 ± 5 °C
3. Assembly Guide

■ Fixation of COB

Fixing of COB is usually used in two basic methods:
One is using the fixation screw, the other is using the holder, which are provided by holder makers.

- Using fixation screw

This COB could be fixed by fastening 2 pairs of screw and washer.
The concaved corner is adequate shape for fixing COB with screws of M3.
The torque of fixing screw is recommended to be 0.7~1.0N·m.

The corner nearby electrode pad should not be allowed to fix screw. It is highly possible to bring about the electrical shortage.

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Using specific holder for COB

Considering holders, the luminaire is consisted of the key parts like as shown in below figures.

As described earlier, three main parts have to be well-functioned as thermal, optical and electrical.

The holder plays the role which can connect all key parts so as to properly perform the their functions.

This means that the holder is very simple and safe to fix the COB in the manufacturing luminaires.

The below figure describe the assembly process by using the holder.