Assembly Guideline for ZVS Buck and Buck-Boost
10 x 10mm and 10 x 14mm LGA/BGA Packages

Description

This application note provides information and recommendations relevant to handling procedures and assembly with the 10 x 10 and 10 x 14 Land Grid Array (LGA) and Ball Grid Array (BGA) packages.

SiP Details

- Refer to 10 x 10 and 10x14mm Package Drawings respectively.
- All pads are SMD (solder mask defined).
- All pads are Ni/Au finish.

LGA

- All pads are 0.55 x 0.55mm (exposed copper area).
- MSL rating - MSL3 @ 245°C.

BGA

- All solder bumps are .64mm diameter.
- MSL rating - MSL3 @ 245°C.

Receiving PCB Pad

- OSP, ENIG, ENEPiG, or Ni/Au finish recommended.
- Pads within planes/polygons are SMD only, with 0.55 x 0.55mm final size solder mask openings.
- Signal pads can be either SMD or NSMD (non-solder mask defined).
- SMD signal pads should have a minimum copper pad of 0.65 x 0.65mm, with a solder mask opening of 0.55 x 0.55mm.

LGA

- All pads have exposed copper area of 0.55 x 0.55mm.
- NSMD should have a copper defined pad of 0.55 x 0.55mm, with a solder mask opening of 0.65 x 0.65mm.

BGA

- All pads have exposed copper area of 0.45mm diameter pad opening.
- NSMD should have a copper defined pad of 0.45mm diameter Cu defined/SM opening of 0.6mm.
Receiving PCB Board (LGA/BGA)
- Board should be made from FR4 – Tg 170°C or higher rated material.
- Board should have a minimum of four layers of 2oz copper.
- Planes/Polygons underneath part should not have thermal reliefs around SMD pads or vias.
- Thermal vias are recommended, please refer to specific product data sheets for information.
- Silkscreen under the SiP is not recommended.

Solder-Paste Stencil

LGA
- Recommended stencil openings for pads is 0.45 x 0.45mm (80% aperture) using a 5mil or 6mil stencil thickness.
- Aperture size should not exceed 95% to ensure paste is not in the solder mask area.

BGA
- Recommended stencil openings are .40mm diameter (90% aperture) using a 4mil or 5mil stencil thickness.
- Flux can also be used using a 2mil thick stencil.

Assembly and Cleaning
- Handling and storage of SiPs per IPC 1601, JEDS625-B
- Pre-bake components based on component MSL rating prior to assembly (per IPC/JEDEC J-STD-020D.1)
- Pick and place should be from the center of the component
- Pb or Pb free (SAC305), low voiding solder paste such as AIM WS488, Kester 520A, or equivalent
- Aqueous clean using a saponifier or ultrasonic
- DI water spray for under SiP cleaning

Inspection
- X-ray inspection is recommended for solder joint inspection
- Up to 25% area voiding per pad is acceptable

Rework and Removal
- Rework maximum temperature should not exceed 245°C (from Table 3).
- Removed SiP should not be reused.

Moisture Sensitivity Level (MSL)
- Components are baked and dry-packed before shipment.
- Components should remain in a dry vacuum bag during storage prior to assembly.
- A MSL label is attached to the outside bag.
- Within the bag is a humidity indicator card and desiccant.
- Shelf life of the components sealed in the bag is 2 years at < 40°C and < 90% room humidity (RH).
- The MSL label indicates maximum open air exposure and bake times.
- Please reference JEDEC standard J-STD-033 for additional information.
Table 1
Reflow profile recommendations (JEDEC/IPC J-STD-020D.1)[a][b][c]

<table>
<thead>
<tr>
<th>Profile Feature</th>
<th>Sn-Pb Eutectic Assembly</th>
<th>Pb-Free Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heat temperature Min ($T_{S\text{MIN}}$)</td>
<td>100°C</td>
<td>150°C</td>
</tr>
<tr>
<td>Pre-heat temperature Max ($T_{S\text{MAX}}$)</td>
<td>150°C</td>
<td>200°C</td>
</tr>
<tr>
<td>Pre-heat time (t$<em>s$) from $T</em>{\text{SMIN}}$ to $T_{\text{SMAX}}$</td>
<td>60 – 120 seconds</td>
<td>60 – 120 seconds</td>
</tr>
<tr>
<td>Ramp-up Rate ($T_{\text{L}}$ to $T_{\text{P}}$)</td>
<td>3°C/second maximum</td>
<td>3°C/second maximum</td>
</tr>
<tr>
<td>Liquidus temperature ($T_{\text{L}}$)</td>
<td>183°C</td>
<td>217°C</td>
</tr>
<tr>
<td>Time ($t_L$) maintained above $T_{\text{L}}$</td>
<td>60 – 150 seconds</td>
<td>60 – 150 seconds</td>
</tr>
<tr>
<td>Peak package body temperature ($T_{\text{P}}$)</td>
<td>220°C</td>
<td>245°C</td>
</tr>
<tr>
<td>Time ($t_p$) within 5°C of peak temperature ($T_{\text{P}}$)</td>
<td>20 seconds</td>
<td>20 seconds</td>
</tr>
<tr>
<td>Ramp-down Rate ($T_{\text{P}}$ to $T_{\text{L}}$)</td>
<td>6°C/second maximum</td>
<td>6°C/second maximum</td>
</tr>
<tr>
<td>Time 25°C to $T_{\text{P}}$</td>
<td>6 minutes maximum</td>
<td>8 minutes maximum</td>
</tr>
</tbody>
</table>

[a] All temperatures refer to the topside of the package, measured at the center of the package on the body’s surface.
[b] Tolerance for $T_{\text{P}}$ is defined as a supplier’s minimum and a user’s maximum.
[c] Product MSL levels are defined in the product data sheet.

Assembly Reflow Guidelines (LGA/BGA)

Figure 1
Reflow classification profile (JEDEC/IPC J-STD-020D.1)
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