

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



Contents	Page
Description	1
Cool-Power SiP Details	1
LGA	1
BGA	1
Receiving PCB Pad	1
LGA	1
BGA	1
Receiving PCB Board (LGA/BGA)	2
Solder-Paste Stencil	2
Assembly and Cleaning	2
Inspection	2
Rework and Removal	2
Moisture Sensitivity Level (MSL)	2
Assembly Re-flow Guidelines (LGA/BGA)	3

Description

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

Cool-Power 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 0.55mm 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, JESD625-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

Assembly Reflow Guidelines (LGA/BGA)

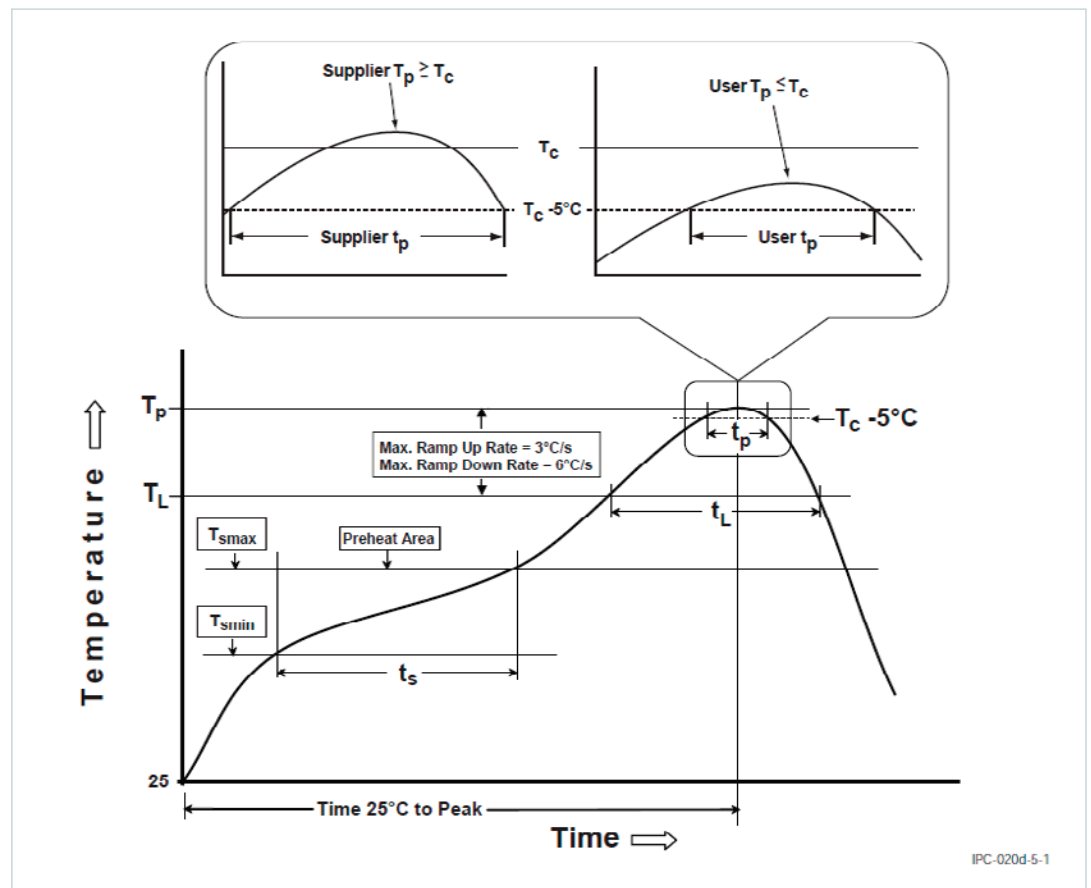
Table 1
Reflow Profile
Recommendations
(JEDEC/IPC J-STD-020D.1) ^[a] ^[b] ^[c]

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Pre-heat temperature Min ($T_{S\text{MIN}}$)	100°C	150°C
Pre-heat temperature Max ($T_{S\text{MAX}}$)	150°C	200°C
Pre-heat time (t_s) from $T_{S\text{min}}$ to $T_{S\text{MAX}}$	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_p)	3°C/second maximum	3°C/second maximum
Liquidus temperature (T_L)	183°C	217°C
Time (t_L) maintained above T_L	60 – 150 seconds	60 – 150 seconds
Peak package body temperature (T_p)	See Table 2	See Table 3
Time (t_p) within 5°C of peak temperature (T_p)	20 seconds	20 seconds
Ramp-down Rate (T_p to T_L)	6°C/second maximum	6°C/second maximum
Time 25°C to T_p	6 minutes maximum	8 minutes maximum

Notes:

- ^[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 TP is defined as a supplier's minimum and a user's maximum.
- ^[c] Product MSL levels are defined in the product data sheet.

Figure 1
Reflow Classification Profile
(JEDEC/IPC J-STD-020D.1)



Limitation of Warranties

Information in this document is believed to be accurate and reliable. HOWEVER, THIS INFORMATION IS PROVIDED "AS IS" AND WITHOUT ANY WARRANTIES, EXPRESSED OR IMPLIED, AS TO THE ACCURACY OR COMPLETENESS OF SUCH INFORMATION. VICOR SHALL HAVE NO LIABILITY FOR THE CONSEQUENCES OF USE OF SUCH INFORMATION. IN NO EVENT SHALL VICOR BE LIABLE FOR ANY INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR SAVINGS, BUSINESS INTERRUPTION, COSTS RELATED TO THE REMOVAL OR REPLACEMENT OF ANY PRODUCTS OR REWORK CHARGES).

Vicor reserves the right to make changes to information published in this document, at any time and without notice. You should verify that this document and information is current. This document supersedes and replaces all prior versions of this publication.

All guidance and content herein are for illustrative purposes only. Vicor makes no representation or warranty that the products and/or services described herein will be suitable for the specified use without further testing or modification. You are responsible for the design and operation of your applications and products using Vicor products, and Vicor accepts no liability for any assistance with applications or customer product design. It is your sole responsibility to determine whether the Vicor product is suitable and fit for your applications and products, and to implement adequate design, testing and operating safeguards for your planned application(s) and use(s).

VICOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN LIFE SUPPORT, LIFE-CRITICAL OR SAFETY-CRITICAL SYSTEMS OR EQUIPMENT. VICOR PRODUCTS ARE NOT CERTIFIED TO MEET ISO 13485 FOR USE IN MEDICAL EQUIPMENT NOR ISO/TS16949 FOR USE IN AUTOMOTIVE APPLICATIONS OR OTHER SIMILAR MEDICAL AND AUTOMOTIVE STANDARDS. VICOR DISCLAIMS ANY AND ALL LIABILITY FOR INCLUSION AND/OR USE OF VICOR PRODUCTS IN SUCH EQUIPMENT OR APPLICATIONS AND THEREFORE SUCH INCLUSION AND/OR USE IS AT YOUR OWN RISK.

Terms of Sale

The purchase and sale of Vicor products is subject to the Vicor Corporation Terms and Conditions of Sale which are available at: (<http://www.vicorpower.com/termsconditionswarranty>)

Export Control

This document as well as the item(s) described herein may be subject to export control regulations. Export may require a prior authorization from U.S. export authorities.

Contact Us: <http://www.vicorpower.com/contact-us>

Vicor Corporation

25 Frontage Road
Andover, MA, USA 01810
Tel: 800-735-6200
Fax: 978-475-6715
www.vicorpower.com

email

Customer Service: custserv@vicorpower.com
Technical Support: apps@vicorpower.com