

# Assembly Instructions for CQFP Packages SMT on PCB

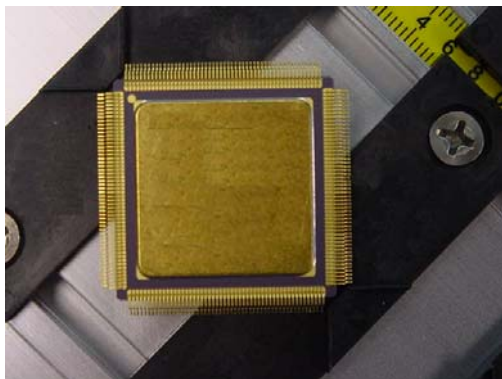
## Introduction

To minimize board-level vibration failure, it is important to attach a ceramic quad flat pack (CQFP) to system boards in the correct way. Following the correct procedures will not completely eliminate vibration failure, but will help prevent initial mistakes, which can minimize vibration failure. Because each customer's application is different, Actel recommends that the user evaluate his/her application requirements and select the right material and procedures when attaching CQFP packages on system boards.

## Attaching CQFP Packages to System Boards

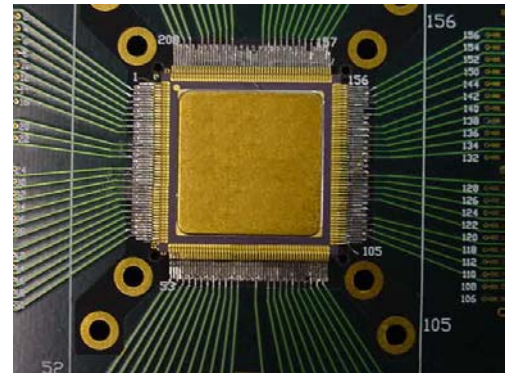
Actel recommends the following procedures for attaching CQFP packages to system boards:

1. **Trim and form.** Actel recommends Fancort Inc. products for trim and form (Figure 1).

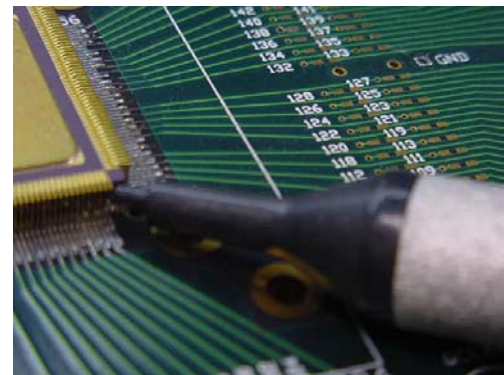


**Figure 1 • CQ Package after Trim and Form**

2. **Soldering.** Solder CQ package on the PCB by hand soldering or reflow (Figure 2). Reflow profiles must be optimized based on customer requirements.
3. **Apply glue or epoxy and cure.** Apply a nonconductive epoxy or glue (thermal-conductive, heat, cure type) between the four corners of the backside of the package and the board (Figure 3). Select the material hardness and property based on vibration frequency, system requirements, and application. Applying glue or epoxy holds down the board and absorbs peak energy during the vibration test, which prevents leads from breaking. Applying an adhesive also conducts heat from the device to the system board.



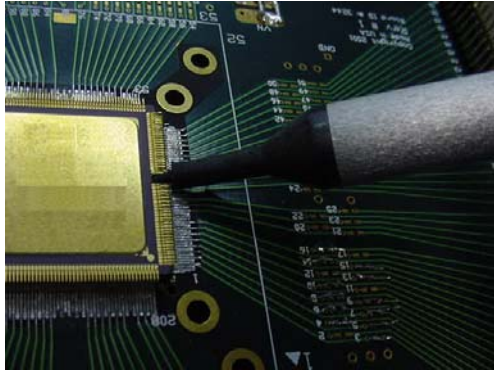
**Figure 2 • CQ Package Soldered on PCB**



**Figure 3 • Applying Glue or Epoxy**

4. **Top coating and cure.** Step three does not eliminate package lead breaking completely. During the vibration test, the braze area (the joint between the lead and the ceramic body) within the four corners contains the highest stress level. Cracking in the braze area can be minimized by applying a UV cure, which is the nonconductive type top coating material on the top of the package. The amount of coating material used is critical. It is best to dispense just enough material to cover the tip of the lead braze (Figure 4 on page 2).

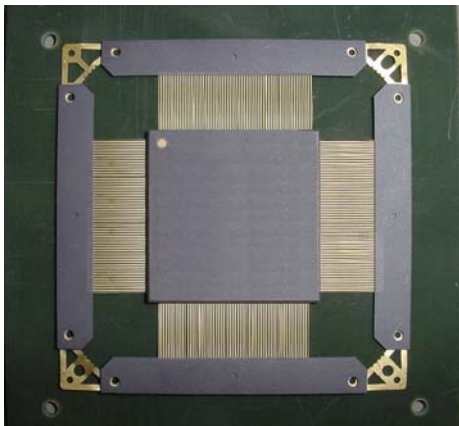
During the vibration test, the top coating material will distribute the same stress from the highly localized stress from the lead braze tip to the whole coating surface. A top coating may not be needed in some cases; therefore, you should determine if a top coat is needed based on the application.



**Figure 4 • CQ Package Soldered on PCB**

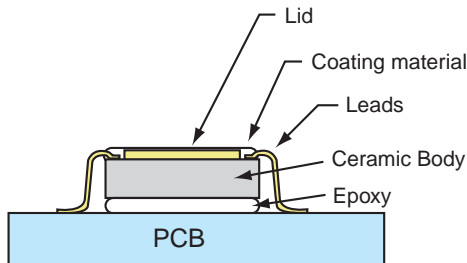
Note: Steps three and four are highly recommended for heavier CQ packages, particularly the CQ256 and CQ352 packages with heat slugs.

Figure 5 shows a bottom view of the CQ package without a heat sink.



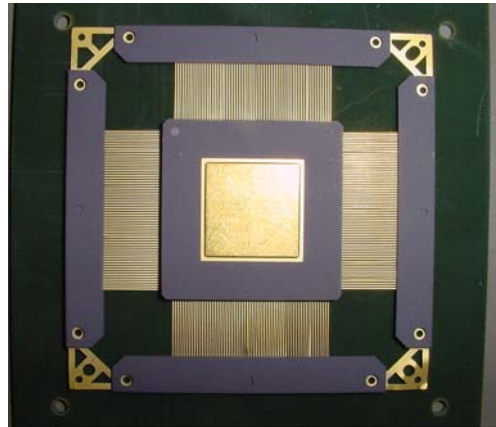
**Figure 5 • CQ Package without Heat Sink – Bottom View**

Figure 6 shows the top coating and bottom epoxy on the CQ package without a heat- sink on the bottom.



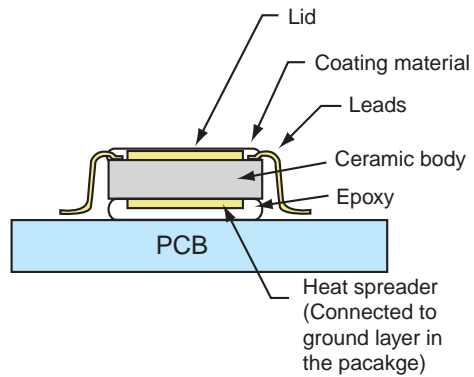
**Figure 6 • Top Coating and Bottom Epoxy on CQ Package with Heat Sink on the Bottom**

Figure 7 shows a bottom view of the heat sink.



**Figure 7 • CQ Package with a Heat Sink – Bottom View**

Figure 8 shows the top coating and bottom epoxy on the CQ package with a heat sink on the bottom.



**Figure 8 • Top Coating and Bottom Epoxy on CQ Package with Heat Sink on the Bottom**

Note: When soldering the CQ package with the heat sink to the PCB, be aware that the heat sink is connected to the package GND layer.

## Common Questions and Answers

Why solder the CQ package on PCB before putting epoxy under the package?

**Putting the epoxy under the package first causes stress on the leads during soldering to the board. This is called pre-stress and can induce lead fatigue.**

Why put thermal-conductive epoxy or glue under the package?

**For heavier packages, it is necessary to hold down the package to the system board and minimize the board vibration test failure. It also helps conduct heat from the device to the system board.**

Why should UV cure type epoxy be applied to the top of the leads, and what type should be used?

**The UV cure provides a quick cure time, and any soft-type material should be used. User's should decide what is the best material for each application, and not every application may require top coating.**

**The UV cure epoxy redistribute stress from highly localized stress in the braze area. This will minimize board-vibration test failures.**

Where can I obtain the materials in steps three and four? Why does Actel not provide an exact set of materials to use?

**Dow Corning, GE, and other polymer material manufactures are a good place to find the materials. Because each application's requirements are different, Actel does not recommend one set of materials. There are other requirements and factors such as outgas, that need to be considered.**

Do we need to do steps three and four together?

**No, in most cases (lighter packages), step four is not necessary. However, if the vibration frequency is high or the test condition is tough, you may need to perform step four. Again, evaluate your own requirements and decide what is needed for your application.**

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**Actel Corporation**

955 East Arques Avenue  
Sunnyvale, California 94086  
USA

**Tel:** (408) 739-1010

**Fax:** (408) 739-1540

**Actel Europe Ltd.**

Dunlop House, Riverside Way  
Camberley, Surrey GU15 3YL  
United Kingdom

**Tel:** +44 (0)1276 401450

**Fax:** +44 (0)1276 401490

**Actel Japan**

EXOS Ebisu Bldg. 4F  
1-24-14 Ebisu Shibuya-ku  
Tokyo 150 Japan

**Tel:** +81 03-3445-7671

**Fax:** +81 03-3445-7668

**Actel Hong Kong**

39th Floor  
One Pacific Place  
88 Queensway  
Admiralty, Hong Kong  
Tel: 852-22735712