Application Note

Assembly Instructions for CQFP Packages SMT on PCB

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1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision 1.0

Revision 1.0 was published in September 2017. It was the first publication of this document.

2 Assembly Instructions for CQFP Packages SMT on PCB

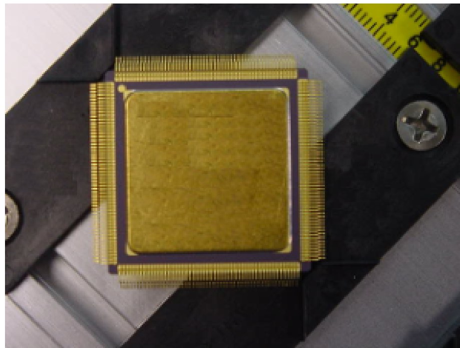
To minimize board-level vibration failure, it is important to attach a ceramic quad flat pack (CQFP) to system boards correctly. Following the correct procedures will not completely eliminate vibration failure, but it will help prevent initial mistakes, which can minimize vibration failure. Because each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

2.1 Attaching CQFP Packages to System Boards

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

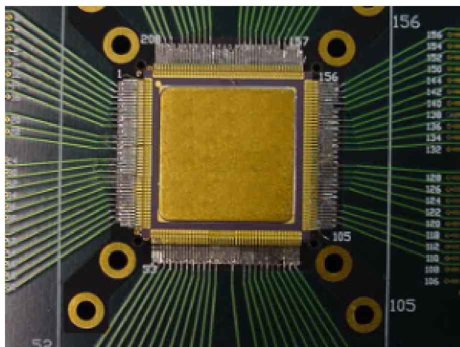
1. Trim and form (Fancort Inc. products are recommended).

Figure 1 • CQ Package After Trim and Form



2. Solder CQ package on the PCB by hand soldering or reflow. Reflow profiles must be optimized based on customer requirements.

Figure 2 • CQ Package Soldered on PCB

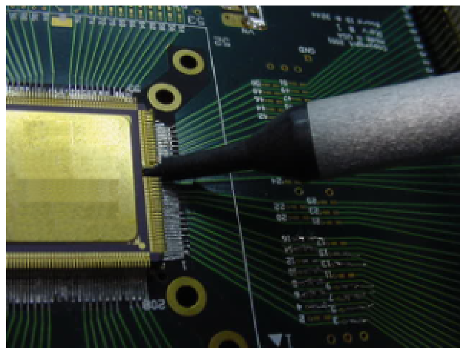


3. Apply a non-conductive epoxy or glue (thermal-conducive, heat, cure type) between the four corners of the backside of the package and the board. Select the material hardness and property based on vibration frequency, system requirements, and application. Applying glue or epoxy holds down the board 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 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 non-conductive 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 • CQ Package Soldered on PCB

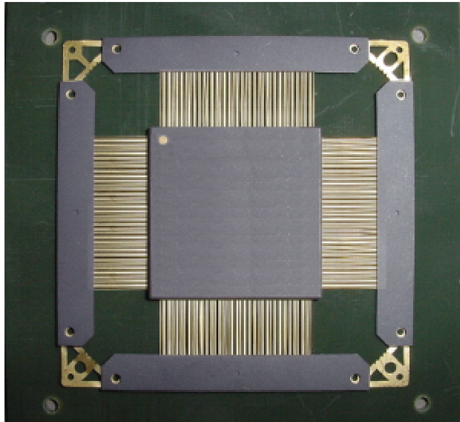


During the vibration test, the top coating material will distribute the same stress from the highly localized stress from the lead braze tip to the whole coating surface. A top coating may not be needed in some cases; therefore, determine if a top coat is needed based on the application.

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

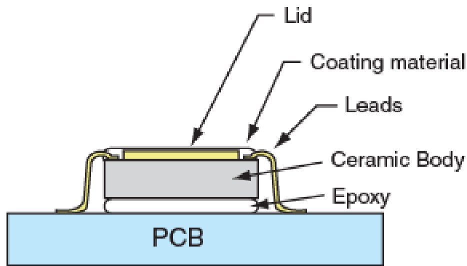
The following image shows a bottom view of the CQ package without a heat sink.

Figure 5 • CQ Package Without Heat Sink—Bottom View



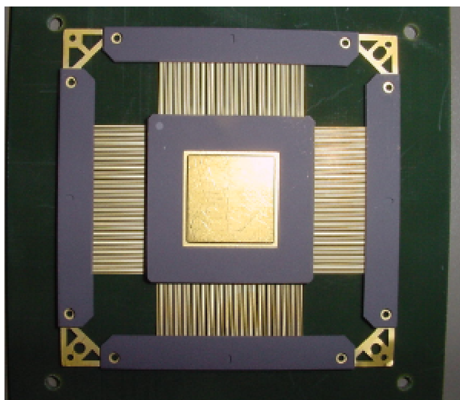
The following illustration shows the top coating and bottom epoxy on the CQ package without a heat sink on the bottom.

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



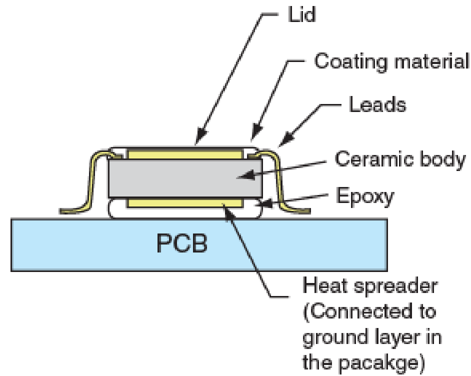
The following image shows a bottom view of the heat sink.

Figure 7 • CQ Package with a Heat Sink—Bottom View



The following illustration 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.

2.2 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. Decide the best material for each application, as 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 the materials in steps three and four be obtained? Why doesn't Microsemi 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, Microsemi does not recommend one set of materials. There are other requirements and factors, such as outgas, that need to be considered.

Do steps three and four need to be done 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, step four may be needed. Again, decide what is needed based on the application.

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