Introduction

Barry Industries products with a “CT” metallization scheme are widely used in customer applications that require solder mounting. This application note addresses the requirements for soldering to achieve the specified performance.

Discussion

The Barry Industries product line of chips and devices utilizing our “CT” metallization scheme was developed to be solder mounted. When properly soldered, the customer will realize consistent, reliable performance. Proper soldering technique is paramount to the reliability. Barry Industries has designed their devices to be soldered in accordance with the Industry Standard IPC-A-610. This standard is quite extensive and is available for purchase at www.ipc.org, but for the purposes of this discussion, a few of the key elements will be highlighted.

IPC-A-610 defines an acceptable solder joint to have the following characteristics.

- A solder fillet will appear generally smooth and exhibits good wetting of the solder to the parts being joined
- The outline of the parts being soldered is easily determined
- Solder at the joint creates a feathered or blended edge
- Fillet is either concave in shape or has a wetting angle not exceeding 90 degrees.

The figure below illustrates the definition of the wetting angle as specified in IPC-A-610.

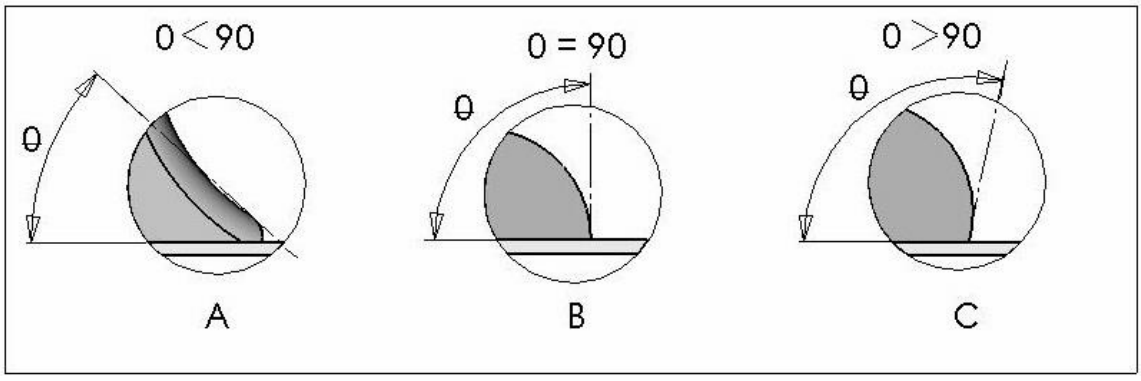
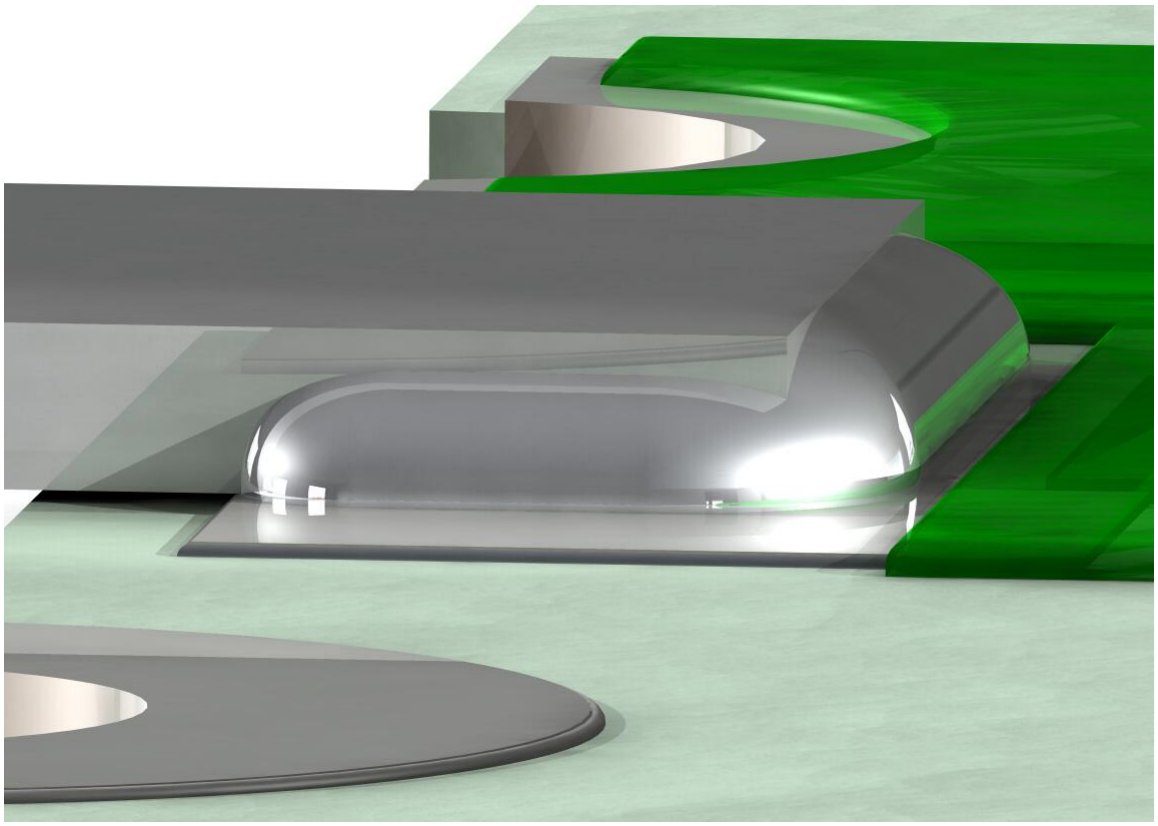


Figure A. depicts a contact angle of less than 90 degrees and Figure B. equal to 90 degrees. Both are considered acceptable. Figure C. shows a contact angle of greater than 90 degrees and would be considered unacceptable.

Consider how these guidelines apply to a typical Barry product.



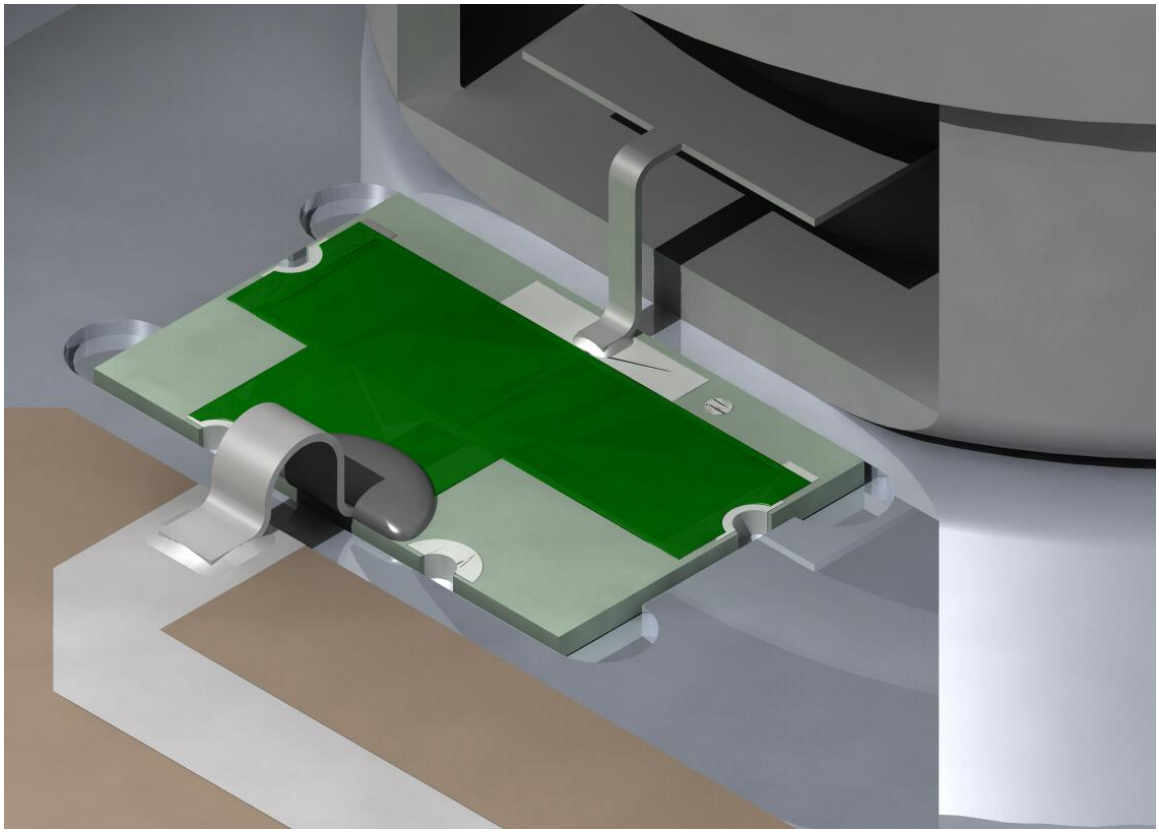
The rendering above depicts a typical lead attachment to a Barry "CT" chip. Notice that the fillet appears generally smooth and exhibits good wetting. There is good feathering or blending of the solder fillet to the areas of attachment, as well. This joint appears "bright" in nature but for customers using non-leaded solders IPC-A-610 does allow for some "dullness" or "graininess" to the joint, provided the joint is not "cold."

Photographs of actual joints with the same characteristics are included in Appendix A along with photographs of joints violating the recommendation.

The solder amount is minimal and the outline of the attached parts is readily discernable. This minimal amount of solder accomplishes two things, in addition to meeting the IPC standard. First, it maintains the ductility of the lead thereby putting less stress on the solder joint. Excess solder creates a "beam" effect, stiffening the joint causing a greater

likelihood of failure. Second, the solder is well within the boundaries of the input pad, which has been designed with the proper metallization to support the soldering process. The chip is not designed to support the soldering process past that boundary.
Notice that the wetting angle is not concave in shape but in this case is equal to 90 degrees. This would be the maximum allowable wetting angle permitted under IPC-A-610.

It should also be recognized that to maintain clear distinction of the outline of the pieces and a minimal solder amount, the parts to be soldered must be in intimate contact with each other. This also provides the most efficient thermal transfer and is a good hedge against the possibility of a "cold" solder joint. An example where this would be important could be the following customer scenario.



Notice in the above illustration that the customer is soldering a Barry Industries leaded device down, while attaching the lead from the output side to a circuit board and attaching a lead to the input side of the chip, all at the same time. The solder fillets are minimal, well within the bounds of the input pad and have a fillet shape in accordance with IPC-A-610.

All surfaces must be in intimate contact at all times during the soldering process. There are two ways to accomplish this.

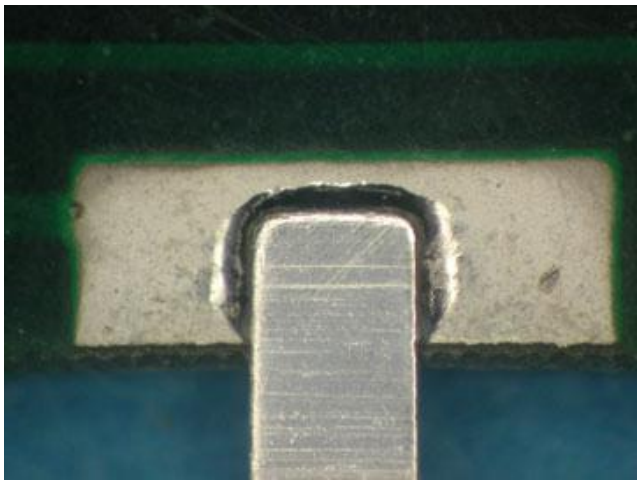
First, fixture the assembly so that there is a constant applied pressure to the chip and pre-stress the leads so that they remain in contact during the reflow process.

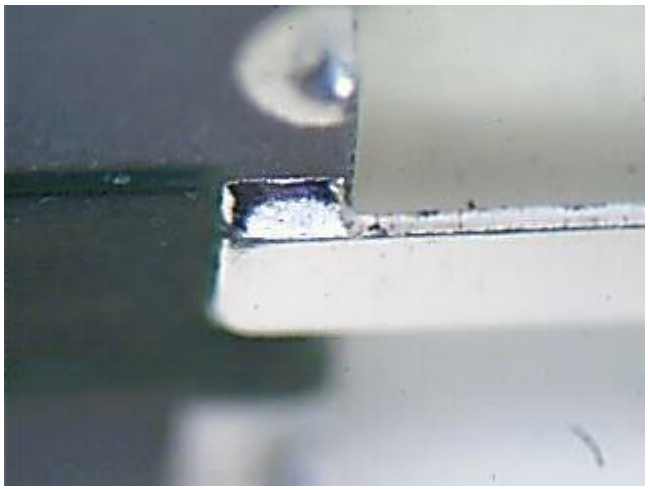
Or

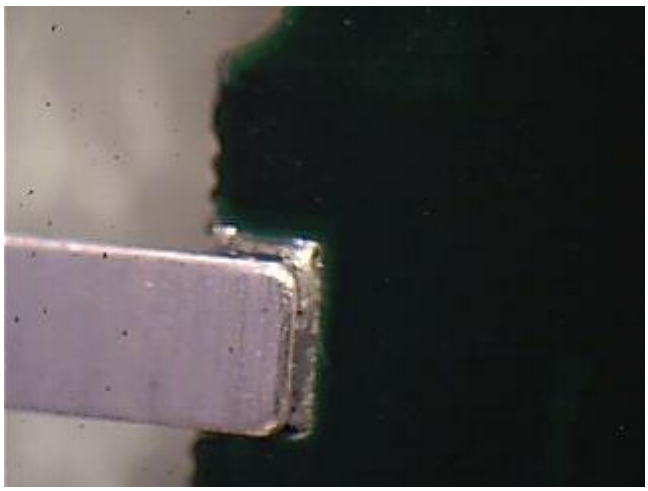
Second, fixture the assembly so that there is a constant force applied to the leads and chip at all times during the reflow process.

Note: It is not acceptable to allow the leads or chip to float above the surface to be soldered and allow the solder to bridge the gap. This will violate the acceptable solder joint characteristics as defined by IPC-A-610. The typical defects caused by using solder to bridge a large gap include excess solder, excessive wetting angle, rough surface, or “cold joint” and inability to see the outline of the leads soldered to the pads.

APPENDIX A
Acceptable Solder Joint Photographs







Unacceptable Solder Joints