METHOD 2009.9

EXTERNAL VISUAL

1. PURPOSE. The purpose of this test method is to verify the workmanship of hermetically packaged devices. This test method shall also be utilized to inspect for damage due to handling, assembly, and/or test of the packaged device. This examination is normally employed at outgoing inspection within the device manufacturer's facility, or as an incoming inspection of the assembled device.

2. APPARATUS. Equipment used in this test shall be capable of demonstrating device conformance to the applicable requirements. Equipment shall include optical devices capable of magnification of at least 1.5X to 10X, with a relatively large and accessible field of view.

3. PROCEDURE

3.1 Magnification. Devices shall be examined at 1.5X to 10X magnification. Devices may be examined anywhere in the range of 1.5X to 10X, however, acceptable product must be capable of passing all criteria when examined at 10X magnification. Individual glass seals (see 3.3.8) shall be examined at 7X to 10X magnification.

3.2 Foreign material. When foreign material is present, and its adherence is in question, the device may be subjected to a clean filtered gas stream (vacuum or expulsion) of approximately 20 psig.

3.3 Failure criteria. Devices shall fail if they exhibit any of the following:

3.3.1 General

a. Illegible marking, or marking content or placement not in accordance with the applicable specification.

b. Presence of any secondary coating material that visually obscures a seal area(s) (i.e., any hermetic interface).

c. Evidence of any nonconformance with the detail drawing or applicable procurement document, or absence of any required feature.

3.3.2 Foreign/displaced material

a. Braze material flow, or other foreign material (i.e., contamination or corrosion) that reduces the isolation between leads or between braze pads to less than 50% of the lead separation (pad separation for brazed leads) but in no case less than the case outline minimum.

b. Leads or terminals that are not free of foreign material such as paint or other adherent deposits.

3.3.3 Construction defects

a. Protrusions on the bottom (mounting) surface of the package that extend beyond the seating plane.

b. Protrusions (excluding glass run-out) on any other package surface that exceed the lead thickness in height (leaded packages).

c. Protrusions on the lid or cover, or extending beyond the surface plane of solder pads, that exceed 25% of the terminal width in height (leadless packages).

d. Metallization not intended by design between solder pads, between elements of thermal patterns and/or between seal ring or lid to metallized castellations that reduce the isolation to less than 50% of pad separation (leadless packages).

c. Radial cracks that exhibit the following:

1. Cracks that do not originate at the lead (see figures 2009-5a and 2009-5b).

2. Three or more cracks that extend beyond the midpoints of distance from the lead to the case (see figure 2009-5c).

3. Two cracks that extend beyond the midpoint of the distance from the lead to the case and that lie within the same quadrant (see figure 2009-5d).

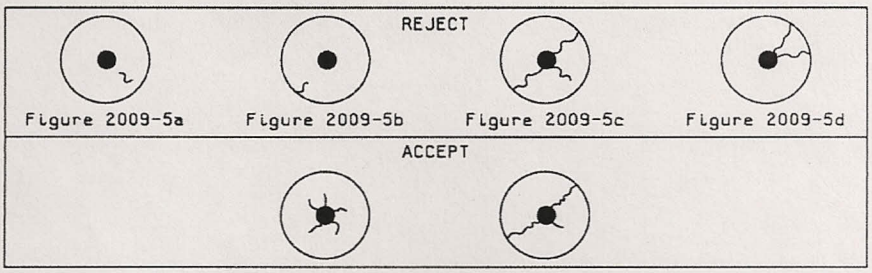


FIGURE 2009-5. Radial Cracks.

d. Any chip-out that penetrates the sealing glass deeper than the glass meniscus plane. The glass meniscus is defined as that area of glass that wicks up the lead or terminal. Exposed base metal as a result of meniscus chip outs is acceptable, provided that the exposed area is no deeper than 0.010 inch (see figure 2009-6).

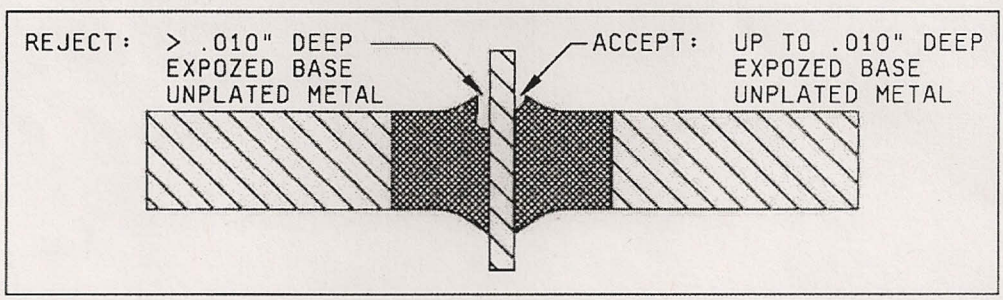
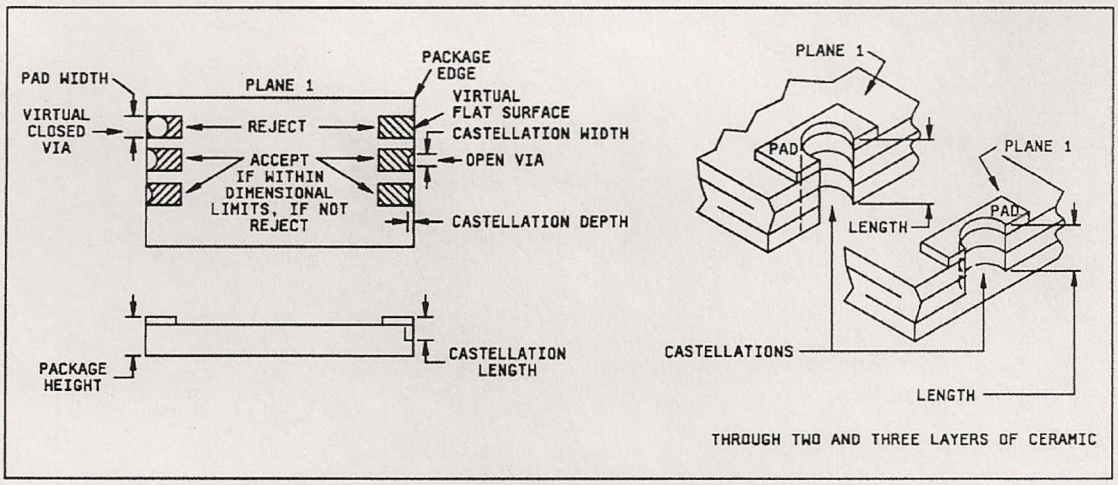


FIGURE 2009-6. Chip-outs.



NOTE: Ceramic layers shift, edges are rough after punching, plating buildup is not smooth etc., all of these combine during package manufacture to make the castellation measurement difficult. Therefore, in the event of conflicts in determining castellation acceptance, direct contact measurement shall be made using the limits specified in MIL-STD-1835.

FIGURE 2009-2. Castellation requirements

3.3.8 Glass seals.

a. Crazing of the glass seal surface (see figure 2009-3).

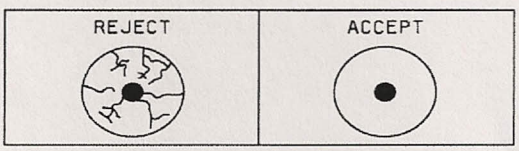


FIGURE 2009-3. Crazed glass surface.

b. Any single circumferential crack (or overlapping crack) that does not lie completely within a single quadrant (i.e., extends beyond 90° arc or rotation about the lead), and extends beyond or is located in the region beyond the midpoint of distance from the lead to the case (see Figure 2009-4).

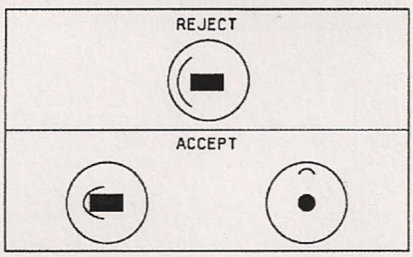


FIGURE 2009-4. Circumferential cracks.

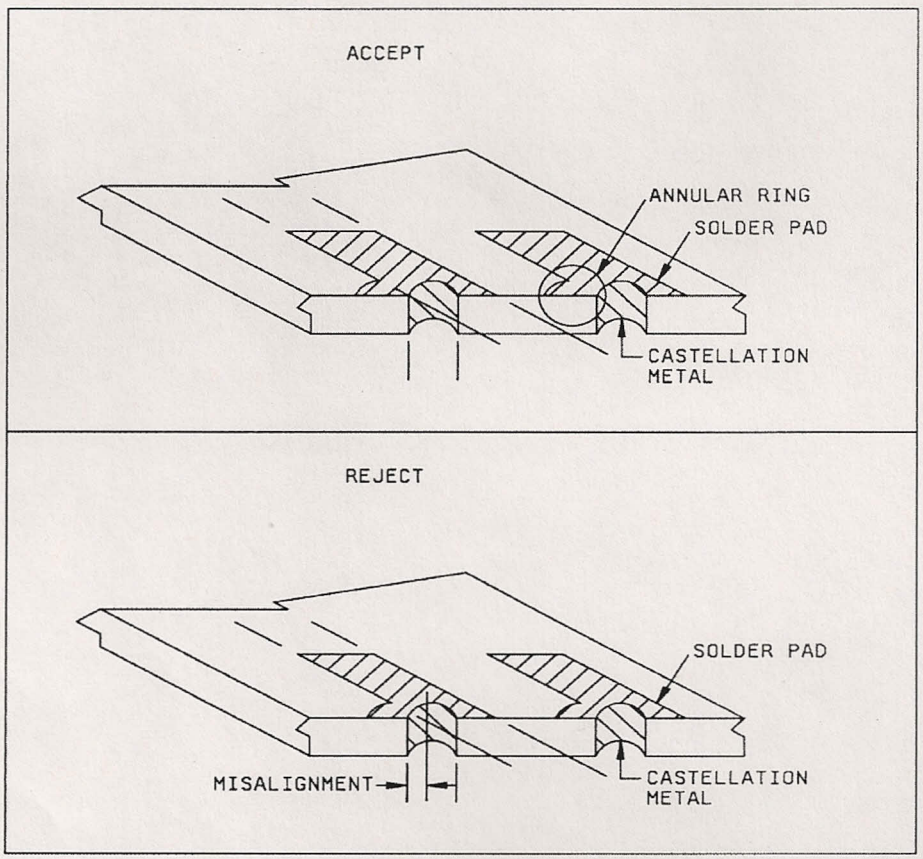


FIGURE 2009-1. Castellation to solder pad misalignment.

d. Castellation configuration not in accordance with the following (see figure 2009-2). The castellation shall be roughly concave, confined by a 3-dimensional space traversing all castellated ceramic layers at the package edge. The surface of the castellation may be irregular. The "3-dimensional space" has these dimensions:

1. Minimum width >1/3 package terminal pad width.
2. Minimum depth > 1/2 castellation minimum width.
3. Length = as designed (see figure 2009-2).
4. Maximum width ≤ package terminal pad width.
5. Maximum depth ≤ 1/2 castellation maximum width.

These dimensions are an attempt to ensure with some reasonableness that the castellations are not viewed, in the extreme sense, as virtual flat surfaces on the package edge and are not virtual closed vias (holes).