

ENGINEERING PRACTICE STUDY

PROJECT NUMBER: 5961-2017-021

TITLE:

MIL-STD-750-2, TEST METHOD 2068:
PROPOSAL TO CLARIFY THE ACCEPT/REJECT CRITERIA
FOR NONTRANSPARENT GLASS-ENCASED, NONCAVITY DIODES
AND REFORMAT CONTENT

25 OCTOBER 2017

FINAL REPORT

STUDY CONDUCTED BY

DLA LAND AND MARITIME - VAC

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Active Devices Branch

Approved by:
Thomas Hess
Chief
Active Devices Branch

ATTCH 3

I. OBJECTIVES: The objective of this Engineering Practice (EP) Study was to obtain input from the military services, device manufacturers, laboratories, and user community concerning a proposed revision to test method 2068 of MIL-STD-750-2 (see attachments 1 and 2).

II. BACKGROUND: Test method 2068.0 of MIL-STD-750-2 (see attachment 3) had not been revised since it was added to the standard when MIL-STD-750 Revision C with Change Notice 4 was issued on 30 April 1992. The US Navy asked for clarification in regards to the accept/reject requirements for the diodes covered by the test method. A Test Method 2068 Study Group (TMSG), which consisted of the preparing activity and a small group of users from both industry and the military, was formed for this project and after many discussions, a draft of test method 2068.1 was agreed upon.

The initial draft of this EPS with the draft of test method 2068.1 was coordinated to the FSC 5961 community and DLA Land and Maritime had requested that those activities that have an interest in test method 2068 to review the proposed revision.

III. RESULTS: Essential, technical and suggested comments were received regarding the proposed revision of test method 2068.1. The TMSG reviewed and assigned a recommended disposition to all comments. That recommended disposition was coordinated to all commenters and there were no objections to the assigned disposition. All accepted comments have been incorporated into the final report draft of test method 2068.1.

Attachment 1 is a reading draft of test method 2068.1 with no highlighting and attachment 2 has the same exact words as attachment 1, but has the changes proposed for test method 2068.1 identified by yellow highlighting.

IV. CONCLUSIONS: The format and technical changes as proposed for test method 2068.1, as documented in attachment 1, should be proposed for incorporation into the next standardization document change action to MIL-STD-750-2.

V. RECOMMENDATIONS: Prepare an initial draft of MIL-STD-750-2 with the results of this study used for the draft of test method 2068.1.

The point of contact for this final report is Mr. David Corbett, DLA Land and Maritime – VAC, P. O. Box 3990, Columbus, OH 43218-3990. Mr. Corbett can also be reached at 614-692-0526 / DSN 850-0526, or by facsimile at 614-693-642 / DSN 850-1642, or by e-mail to: 750.TestMethods@dla.mil.

METHOD 2068.1

EXTERNAL VISUAL FOR NONTRANSPARENT GLASS–ENCASED,
DOUBLE PLUG, NONCAVITY DIODES

1. Purpose. The purpose of this test method is to visually inspect nontransparent glass–encased, double plug, noncavity, axial leaded or surface mount semiconductor devices for defects which may affect the integrity of the hermetic seal.
2. Apparatus. The apparatus for this test method shall consist of the following:
 - a. Optical equipment, such as a binocular microscope, with sufficient lighting capable of the specified magnification(s).
 - b. Adequate fixturing for handling the devices being inspected without causing damage.
 - c. Adequate covered storage and transportation containers to protect devices from mechanical damage and environmental contamination.
 - d. Any visual standards (e.g., drawings, photographs) necessary to enable the inspector to make objective decisions as to the acceptability of devices being inspected.
3. Definitions (see [figure 2068–1](#)). The definitions for all terms used herein shall be as specified in [MIL–PRF–19500](#) and those contained herein. The following definitions shall apply for this test method.
 - a. Critical glass area. This is the area in the central 50 percent of the total plug-die-plug length centered around the die.
 - b. Meniscus area. This area is defined as the outside edge of the body glass extending 25 percent of the total plug-die-plug length from either end.
4. Procedure. The examination shall be performed prior to any body coating. Unless otherwise specified (see 6.d) the devices shall be examined under a magnification of 10X to 20X for evidence of body glass defects.
5. Failure criteria.
 - a. Cracks (see [figures 2068–2](#) and [2068–3](#)). Any device exhibiting cracks in the critical glass area shall be rejected. Cracks or chipouts in the meniscus area at either end of the body glass shall not be cause for rejection.
 - b. Insufficient glass coverage (see [figures 2068–4](#) and [2068–5](#)). Any device where the body glass does not cover a minimum of 50 percent of the total plug-die-plug length shall be rejected. Any device where exposure of a plug is greater than 25 percent of the total plug-die-plug length on either terminal side shall be rejected.
 - c. Meniscus area. Glass pull-back and cracks that start in the meniscus area shall not encroach into the critical glass area.
 - d. Pin holes or voids (see [figures 2068–6](#) and [2068–7](#)). Any device with a pin hole or void in the critical glass area shall be rejected if it exposes the die element or the bottom of the pin hole or void is not visible.
6. Summary. The following conditions shall be specified in the applicable performance specification sheet or acquisition document:
 - a. Exceptions or additions to the inspection method.
 - b. When applicable, any applicable requirements for design and construction, including the critical glass area.
 - c. Where applicable, gauges, drawings, and photographs to be used as standards for operator comparison.
 - d. When applicable, specific magnification when other than as specified herein (see 4 above).

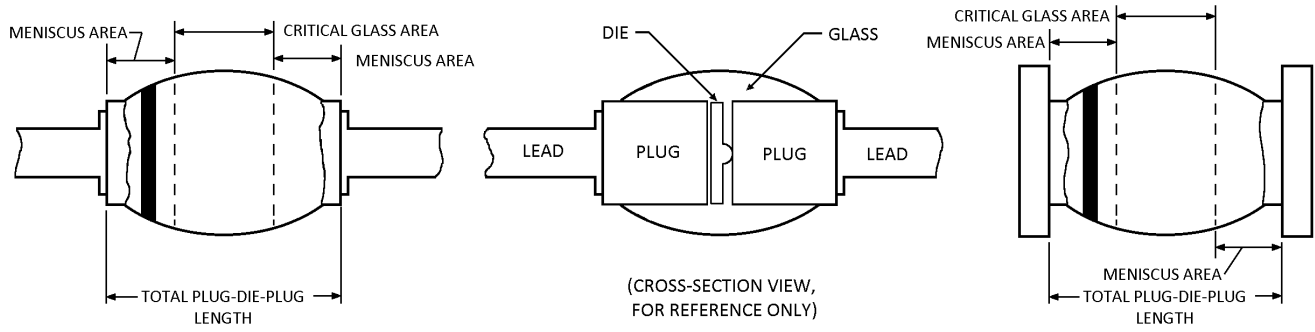
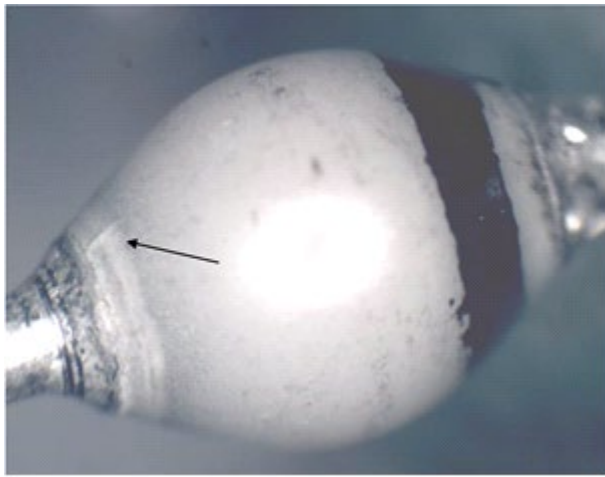
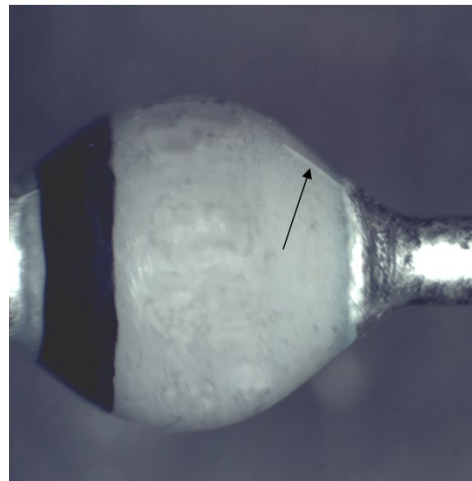


FIGURE 2068-1. Nontransparent glass, double plug, noncavity diode construction (axial leads and SMD end caps shown).



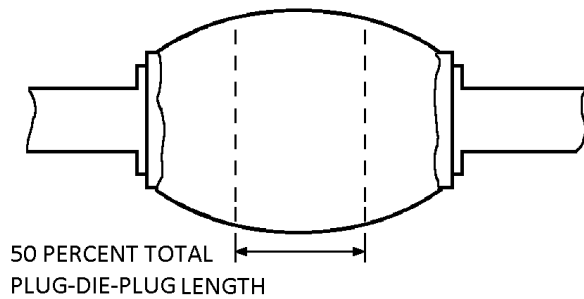
Crack does not encroach into critical glass area.

FIGURE 2068-2. Acceptable body glass cracks.



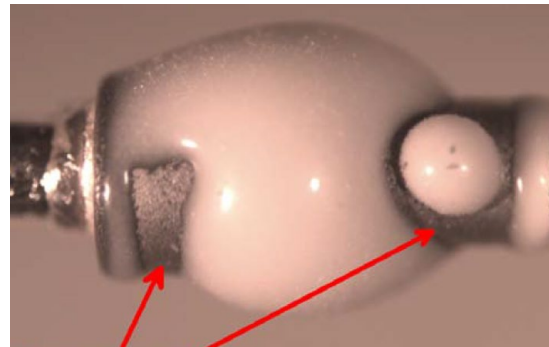
Crack extending into critical glass area.

FIGURE 2068-3. Unacceptable body glass cracks.



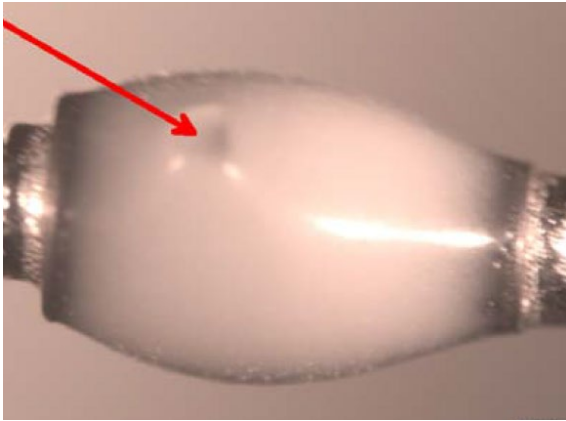
Glass covering critical glass area.

FIGURE 2068-4. Acceptable coverage.



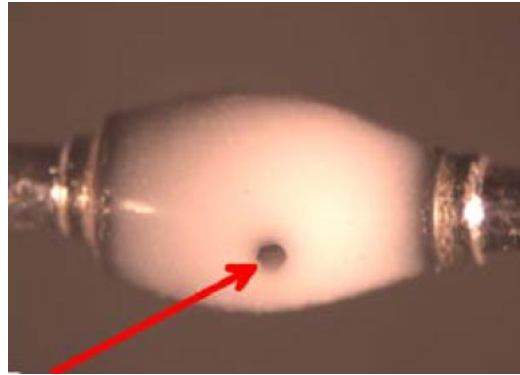
Glass not covering critical glass area.

FIGURE 2068-5. Unacceptable coverage.



Depression where bottom is visible.

FIGURE 2068–6. Acceptable depression.



Void exposing die.

FIGURE 2068–7. Unacceptable void.

METHOD 2068.1

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2. Apparatus. The apparatus for this test method shall consist of the following:
 - a. Optical equipment, such as a binocular microscope, with sufficient lighting capable of the specified magnification(s).
 - b. Adequate fixturing for handling the devices being inspected without causing damage.
 - c. Adequate covered storage and transportation containers to protect devices from mechanical damage and environmental contamination.
 - d. Any visual standards (e.g., drawings, photographs) necessary to enable the inspector to make objective decisions as to the acceptability of devices being inspected.
3. Definitions (see figure 2068–1). The definitions for all terms used herein shall be as specified in MIL-PRF-19500 and those contained herein. The following definitions shall apply for this test method.
 - a. Critical glass area. This is the area in the central 50 percent of the total plug-die-plug length centered around the die.
 - b. Meniscus area. This area is defined as the outside edge of the body glass extending 25 percent of the total plug-die-plug length from either end.
4. Procedure. The examination shall be performed prior to any body coating. Unless otherwise specified (see 6.d) the devices shall be examined under a magnification of 10X to 20X for evidence of body glass defects.
5. Failure criteria.
 - a. Cracks (see figures 2068–2 and 2068–3). Any device exhibiting cracks in the critical glass area shall be rejected. Cracks or chipouts in the meniscus area at either end of the body glass shall not be cause for rejection.
 - b. Insufficient glass coverage (see figures 2068–4 and 2068–5). Any device where the body glass does not cover a minimum of 50 percent of the total plug-die-plug length shall be rejected. Any device where exposure of a plug is greater than 25 percent of the total plug-die-plug length on either terminal side shall be rejected.
 - c. Meniscus area. Glass pull-back and cracks that start in the meniscus area shall not encroach into the critical glass area.
 - d. Pin holes or voids (see figures 2068–6 and 2068–7). Any device with a pin hole or void in the critical glass area shall be rejected if it exposes the die element or the bottom of the pin hole or void is not visible.
6. Summary. The following conditions shall be specified in the applicable performance specification sheet or acquisition document:
 - a. Exceptions or additions to the inspection method.
 - b. When applicable, any applicable requirements for design and construction, including the critical glass area.
 - c. Where applicable, gauges, drawings, and photographs to be used as standards for operator comparison.
 - d. When applicable, specific magnification when other than as specified herein (see 4 above).

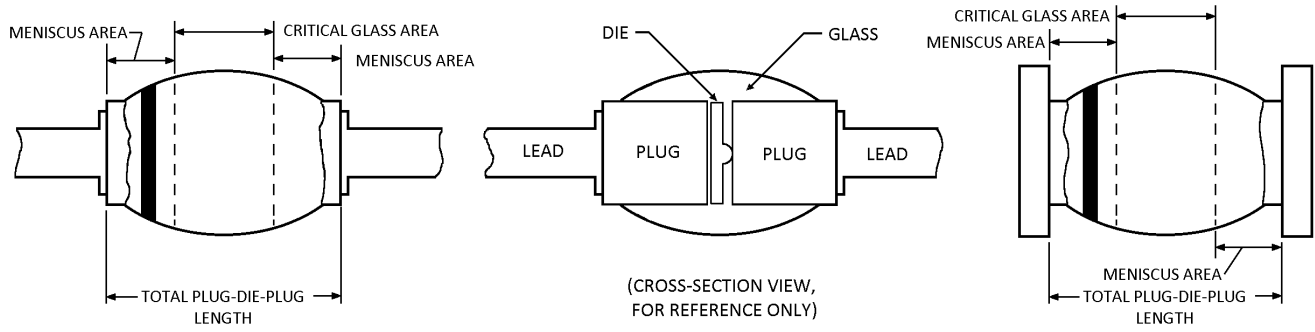
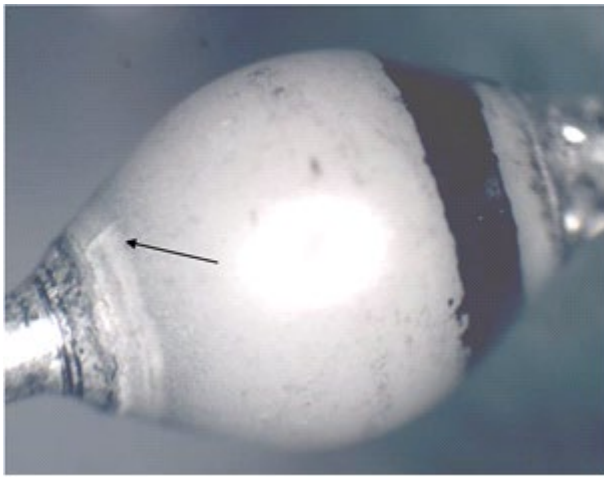
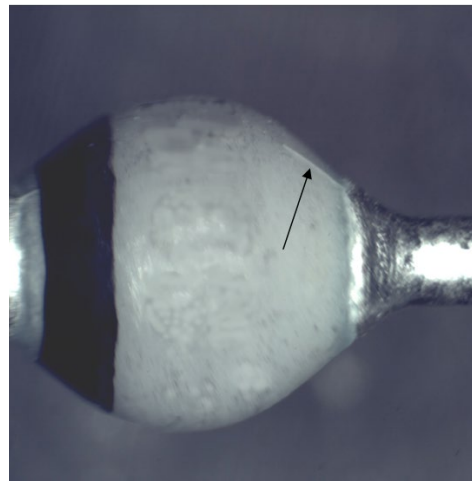


FIGURE 2068-1. Nontransparent glass, double plug, noncavity diode construction (axial leads and SMD end caps shown).



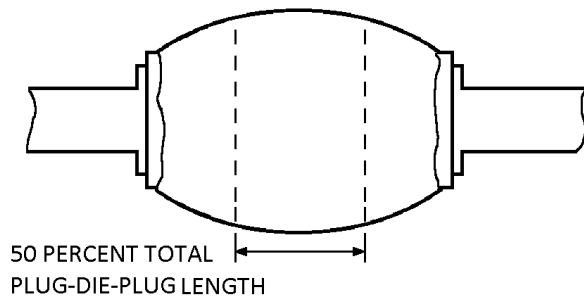
Crack does not encroach into critical glass area.

FIGURE 2068-2. Acceptable body glass cracks.



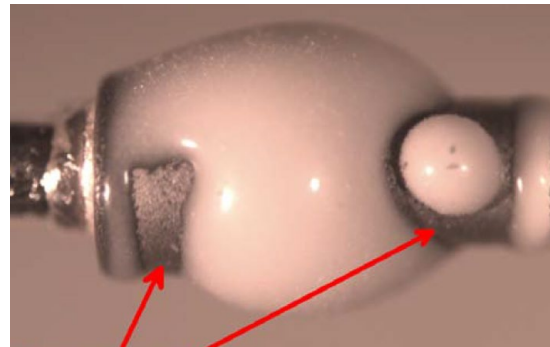
Crack extending into critical glass area.

FIGURE 2068-3. Unacceptable body glass cracks.



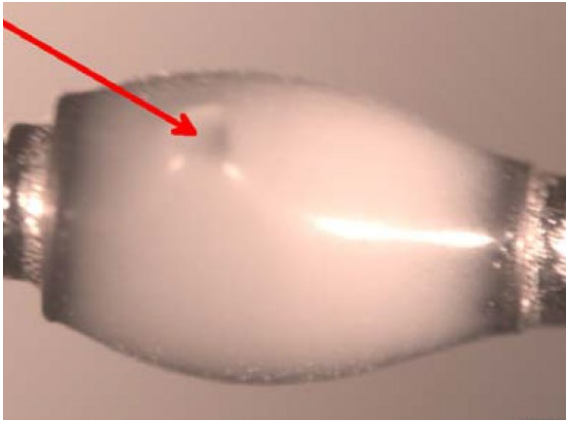
Glass covering critical glass area.

FIGURE 2068-4. Acceptable coverage.



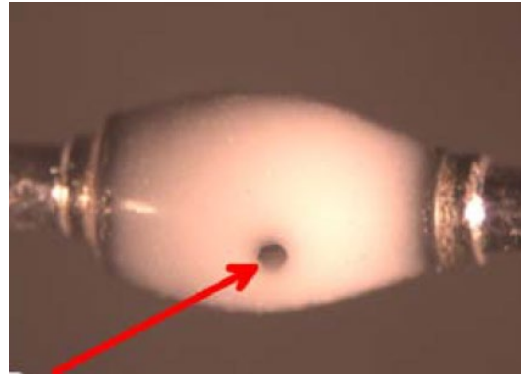
Glass not covering critical glass area.

FIGURE 2068-5. Unacceptable coverage.



Depression where bottom is visible.

FIGURE 2068–6. Acceptable depression.



Void exposing die.

FIGURE 2068–7. Unacceptable void.

MIL-STD-750-2A

METHOD 2068

EXTERNAL VISUAL FOR NONTRANSPARENT GLASS-ENCASED,
DOUBLE PLUG, NONCAVITY AXIAL LEADED DIODES

1. Purpose. The purpose of this test method is to visually inspect glass-encased, double plug, noncavity, axial leaded semiconductor devices for cracks which may affect the integrity of the hermetic seal.
2. Apparatus. A binocular microscope with a magnification of 10X to 20X and sufficient lighting for visual inspection of the glass body.
3. Procedure. The examination shall be performed prior to any body coating. The devices shall be examined under a magnification of 10X to 20X for evidence of glass body cracks.
4. Failure criteria. Any device exhibiting cracks in the body glass shall be rejected. Cracks or chipouts in the meniscus area at either end of the body are not cause for rejection.
5. Summary. The following conditions shall be specified in the applicable performance specification sheet or acquisition document:
 - a. Exceptions or additions to the inspection method.
 - b. Where applicable, any conflicts with approved circuit design topology or construction.
 - c. Where applicable, gauges, drawings, and photographs that are to be used as standards for operator comparison.
 - d. When applicable, specific magnification.

MIL-STD-750-2A

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