



Standard Guide to Interpretation of Radiographs of Semiconductors and Related Devices¹

This standard is issued under the fixed designation E431; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide provides illustrations of radiographs of semiconductors and related devices. Low powered transistors (through the TO-11 case configuration), diodes, low-power rectifiers, power devices, and integrated circuits are illustrated with common assembly features. Particular areas of construction are featured for these devices detailing critical points of design or assembly.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E801 Practice for Controlling Quality of Radiological Examination of Electronic Devices

E1161 Practice for Radiologic Examination of Semiconductors and Electronic Components

E1255 Practice for Radioscopy

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 Definitions of terms used in these reference illustrations may be found in Terminology **E1316**, Section D.

4. Significance and Use

4.1 Illustrations provided in this guide are intended for use as references to aid in interpreting film or nonfilm images

resulting from x-ray examinations (see **Table 1**) to ascertain quality of assembly and workmanship.

4.2 Required attributes of the design features or other construction details are not provided but are to be established as mutually agreed upon by manufacturers and users of these devices. Many devices share common assembly features; thus, these interpretations can be used for components not illustrated.

5. Use of Illustrations

5.1 The illustrations in this guide are for use in interpreting radiographs of semiconductors and related devices. They provide reference points and information on the critical areas of such devices. These points must be clearly resolved in the radiographs being interpreted. The radiographs to be interpreted must comply with the requirements of Practice **E801** to ensure suitable image quality with minimal distortion. Additional information on the application of radiographic techniques to semiconductors and electronic components may be found in Test Method **E1161**.

5.2 The illustrations in this guide may also be used to interpret the radioscopy images of semiconductors and related devices when using radioscopy techniques. The radioscopy images to be interpreted must comply with the requirements of Practice **E801** to ensure suitable image quality with minimal distortion. Additional information on the application of radioscopy techniques may be found in Test Method **E1161** and Practice **E1255**.

6. Description

6.1 Description of irregularities and applicable figures are shown in **Table 1**.

7. Keywords

7.1 electronic devices; nondestructive testing; radiographs; radiography; reference illustrations; semiconductors; x-ray

¹ This guide is under the jurisdiction of ASTM Committee **E07** on Nondestructive Testing and is the direct responsibility of Subcommittee **E07.02** on Reference Radiological Images.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.