

## NATIONAL AIRCRAFT STANDARD

AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA, INC., 610 SHOREHAM BUILDING, WASHINGTON 5, D. C.

SPECIFICATION  
SEMICONDUCTOR DIODES

## 1. SCOPE AND CLASSIFICATION

1.1 Scope - This specification sets forth general requirements for semiconductor diodes for use in military electronic equipment and sets forth methods and procedures for measurement and evaluation of these characteristics and attributes. Specific requirements for a particular type of diode are set forth on an accompanying Individual Specification Sheet (ISS). This specification must be accompanied by the appropriate ISS to constitute a diode specification.

1.2 Classification - Diodes are classified in accordance with their ability to withstand ambient temperature ranges as follows:

TABLE I - Class

| Class | Ambient Temperature Range<br>(at sea level) |
|-------|---------------------------------------------|
| A     | -55°C to +90°C                              |
| B     | -65°C to +125°C                             |
| C     | -65°C to +150°C                             |
| D     | -65°C to +200°C                             |

The highest temperature listed for a class corresponds to that temperature at which the diode derates to zero power dissipation.

## 2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications, standards, and publications, of the issue in effect on date of invitation for bids, form a part of this specification:

SpecificationsMilitary

MIL-S-7742 Screw Threads, Standard, Aeronautical

① INACTIVE FOR DESIGN AFTER 1 APRIL 1963  
SEE MIL-S-19500

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by AttributesMIL-STD-202 Test Methods for Electronic and Electrical  
Component Parts

## 3. REQUIREMENTS

3.1 This specification requires that every lot of diodes purchased to meet it shall have met the requirements of the tests set forth on the ISS.

3.2 Definitions - For the purpose of this specification, these definitions shall apply.

3.2.1 Semiconductor Diode - A semiconductor diode is an elementary semiconductor rectifying device having an anode, a cathode, and one rectifying junction.

3.2.2 Rectifying Element - A rectifying element is a circuit element which conducts current readily in one direction only. One or more diodes which are connected in parallel, series or both, to operate as one circuit element is a rectifying element.

3.2.3 Rectifier Assembly - A rectifier assembly is a single structure of one or more rectifier elements.

3.2.4 Forward Direction - The forward direction is the direction of easy current flow (conventional) through the diode; i.e., from the anode to the cathode.

3.2.5 Forward Current - Forward current is the current that flows through the diode, in the forward direction.

3.2.6 Rated Forward Current - The rated forward current is the forward current that can be carried continuously for the specific conditions given in the ISS.

3.2.7 Forward Voltage Drop - Forward voltage drop is the voltage drop which results from the flow of forward current through a diode.

3.2.8 Reverse Direction - Reverse direction is the direction of greater resistance to conventional current flow through the diode; i.e., cathode to anode.

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3.2.9 Reverse Current - Reverse current is the current which flows through a diode in the reverse direction.

3.2.10 Reverse Voltage - Reverse Voltage is the negative voltage which is applied from the anode to the cathode of a diode.

3.2.11 Rated Reverse Working Voltage - The rated reverse working voltage is the negative d.c. voltage which can be continuously applied from the anode to the cathode of a diode for the specific conditions given in the ISS.

3.2.12 Rated Peak Reverse Voltage - The rated peak reverse voltage is the peak negative voltage which can be applied from the anode to the cathode of a diode or element for the specific conditions given in the ISS.

3.2.13 Zener Voltage - (Avalanche Breakdown) - The Zener voltage is the voltage associated with that portion of the reverse E vs. I characteristic of a semiconductor device wherein the voltage remains substantially constant over a considerable range of current values.

3.2.14 Power Rectification Efficiency - The power rectification efficiency is the ratio of the dc output power to the ac input power in any rectifier circuit.

3.2.15 Rated Peak Forward Current - The rated peak forward current is the maximum allowable recurrent peak current that can be carried by the diode for the conditions given in the ISS.

3.2.16 Rated Surge Current - The rated surge current is the maximum allowable single surge of current which can be carried by the diode for the time interval and the condition of prior operation given in the ISS.

3.2.17 Capacitance - Semiconductor diode capacitance is the capacitance measured between the anode and cathode leads under the conditions specified on the ISS.

### 3.2.18 Recovery Time

3.2.18.1 Reverse Recovery Time - The reverse recovery time of a diode is defined as that time measured between the instant of voltage polarity reversal from positive to negative and the instant at which the reverse resistance specified on the ISS is reached.

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3.2.18.2 Forward Recovery Time - The forward recovery time of a diode is defined as that time measured between the instant of voltage polarity reversal from negative to positive and the instant at which the forward resistance as specified on the ISS is reached.

3.2.19 Zener Impedance - The slope of the EI characteristic in the breakdown region,  $\frac{dE}{dI}$  under the condition specified in the ISS.

3.2.20 Zener Regulation - Zener regulation is defined as the change in zener voltage between the two values of zener current specified in the ISS.

3.2.21 Zener Voltage Temperature Dependence - Zener voltage temperature dependence,  $V_Z$ , is defined as the difference in zener voltage from the value measured at 25°C to the value measured at the ambient temperature or temperatures specified on the ISS.

3.2.22 Ambient Temperature - Ambient temperature shall be construed to mean that temperature of the undisturbed free air which is adjacent to the device in question.

3.3 Fungus-Resistant Materials - All external non-metallic parts of the diode shall be inherently non-fungus nutrient.

3.4 Design and Construction - The following are the applicable general requirements for design and construction:

3.4.1 Terminals - Unless otherwise specified on the ISS sheet, solder lugs or lead wires may be of any shape and shall be hot solder dipped or tin-lead plated. In either case, the tin content shall be between 40 and 70 percent. Solder-lug terminals shall be capable of accepting a wire of such diameter as to safely carry rated load.

3.4.2 Threaded Parts - All external threaded parts shall be in accordance with MIL-S-7742 unless otherwise specified.

## 3.5 Marking

3.5.1 Identification Marking - Diodes shall be marked with the manufacturer's name or symbol, part number, date code when specified on the ISS, and polarity designation. (Polarity designation and part number may be combined).

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3.5.2 Terminal Marking - All terminals shall be identified. In two terminal devices the cathode terminal shall be identified.

3.6 Detail Requirements - All requirements specified herein apply to all types of diodes covered by the applicable ISS. Detail requirements or exceptions applicable to individual types will be specified in the ISS. In the event of any conflict between this specification and the requirements of the ISS, the latter shall govern.

## 4. QUALITY ASSURANCE PROVISIONS AND TEST REQUIREMENTS

4.1 These tests are divided into the following general classifications:

- a. Measurement Acceptance Tests - Group A (non-destructive)
- b. Measurement Acceptance Tests - Group B (non-destructive)
- c. Degradation Rate Tests - Group A (semi-destructive)
- d. Degradation Rate Tests - Group B (semi-destructive)

The classifications serve to divide the tests into those which are performed on a 100-percent basis from those which are performed on a sampling basis, and the destructive tests from the non-destructive tests. The functional basis for this classification is explained in 4.3, 4.4 and 4.5. Tests (a), (b), (c), and (d) together comprise both Qualification Tests and Quality Verification Tests, while (a) and (b) together comprise the Inspection Tests. Items furnished shall meet all performance and test requirements specified herein. All tests, including destructive and environmental tests, shall be performed by the manufacturer, or another mutually agreed upon test facility.

The purchaser of diodes supplied in accordance with this specification may repeat the tests as specified on the ISS. Where sampling inspection is specified the sample size will be determined in accordance with MIL-STD-105A, with the size of the shipment being used as the "lot size". Any diodes, shipments, or groups of shipments which do not thus meet the requirements of this specification are not acceptable under this specification.

4.2 Standard Test Conditions - Unless otherwise specified all tests and measurements shall be conducted under the following ambient conditions:

- a. Temperature:  $25 \pm 3^{\circ}\text{C}$  barometric pressure between 28 and 32 inches of mercury and relative humidity less than 80% with no direct draft.

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