

## MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, MICRO-MINIATURE, SWITCHING

TYPE 1N3206

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers the detail requirements for a silicon, micro-miniature, plastic-encapsulated switching diode and shall be in accordance with MIL-S-19500 except as otherwise specified herein. This device shall not be used for new design.

### 1.2 Maximum ratings.

| $v_r$   | $V_R$    | $I_o \frac{1}{}$ | $i_f$ (surge)<br>(1/120-sec) |
|---------|----------|------------------|------------------------------|
| $v(pk)$ | $V_{dc}$ | $mAdc$           | $ma$                         |
| 100     | 80       | 50               | 500                          |

$\frac{1}{}$  For ambient temperature above 25°C, derate 0.4 mAdc/°C,

TEMPERATURE RANGE (OPERATING):  $T_A = -65^\circ C$  to  $+150^\circ C$

TEMPERATURE RANGE (NONOPERATING):  $T_A = -65^\circ C$  to  $+200^\circ C$

BAROMETRIC PRESSURE REDUCED (ALTITUDE OPERATION): 8 mm Hg., min

### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein:

#### SPECIFICATIONS

##### MILITARY

MIL-S-19491 - Semiconductor Devices, Packaging of.  
MIL-S-19500 - Semiconductor Devices, General Specification For.

#### STANDARD

##### MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

### 3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with MIL-S-19500 and as specified herein.

3.2 Abbreviations and symbols. The abbreviations and symbols used herein are defined in MIL-S-19500.

3.3 Design, construction, and physical dimensions. The semiconductor diode shall be of the design, construction, and physical dimensions specified as shown on figure 1.

3.3.1 Encapsulating case material. The encapsulating case material shall be of a plastic material which polymerizes to a rigid condition by virtue of a chemical cross-linking mechanism. Information concerning the material(s) used shall be included with the qualification design data to the qualifying activity.

3.4 Performance characteristics. Performance characteristics shall be as specified in tables I, II, and III.

3.5 Marking. The marking specified in MIL-S-19500 shall be placed on either the unit package or holding strip of the device.

3.5.1 Polarity. The polarity marking shall be indicated with a green dot or color band on the cathode end of the device.

### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I, II, and III.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of groups A, B, and C.

4.4 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table I.

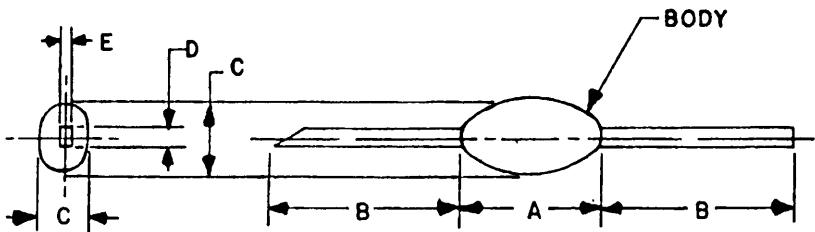
4.5 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table II.

4.6 Group C inspection. Group C inspection shall consist of the examinations and tests specified in table III and shall be conducted on the initial lot and thereafter every six months during production.

4.7 Methods of examination and test. Methods of examination and test shall be as specified in tables I, II, and III and as follows:

4.7.1 Pulse measurement. Pulse measurement shall be in accordance with section 4 of MIL-STD-750.

4.7.2 Thermal shock (temperature cycling). The semiconductor diode shall be maintained at each extreme temperature until thermal equilibrium is reached, but not less than 15 minutes. No longer than 15 minutes shall transpire during changeover from one extreme temperature to other extreme temperature. This test may be started at any point in the cycle.



| DIMENSIONS |        |      |             |      | NOTES |
|------------|--------|------|-------------|------|-------|
| LTR        | INCHES |      | MILLIMETERS |      |       |
|            | MIN    | MAX  | MIN         | MAX  |       |
| A          |        | .100 |             | 2.54 |       |
| B          | .430   |      | 10.92       |      |       |
| C          |        | .045 |             | 1.14 |       |
| D          | .018   | .022 | .46         | .56  |       |
| E          | .003   | .005 | .08         | .13  |       |

NOTE:  
1. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Semiconductor device, diode, type 1N3206.

4.7.3 Terminal strength (lead fatigue). A 3/32-inch thick flat spacer shall be placed between the diode body and the bend during this test.

4.7.4 Steady-state operation life. This test shall be conducted with a half-sine wave of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine wave of the specified average rectified current. The forward conduction angle of the rectified current shall not be greater than 180° nor less than 150°; and the power shall be equal to or greater than that of a half-sine wave.

4.7.4.1 There shall be a spacing of 0.4-inch minimum between the clips holding the diodes on the life-test rack, with the diode body centrally located between the clips.

4.7.4.2 The end-point tests shall be made at 340, 670, and 1,000 hours.

4.7.5 Mechanical damage resulting from tests. Except for inherently deforming, mutilating, or dismembering mechanical-stress tests to which samples are subjected, there shall be no evidence of mechanical damage to any sample as a result of any of the group A, B, or C tests.

4.8 Inspection of preparation for delivery (see 5). Sample items and packs shall be selected and inspected in accordance with MIL-S-19491. (Particular attention should be given to the preservation and packaging, level A, nonhermetically sealed requirements.)

TABLE I. Group A inspection

| Examination or test                     | MIL-STD-750 |                                                                                                                                                                          | LTPD | Symbol   | Limits |       | Unit              |
|-----------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--------|-------|-------------------|
|                                         | Method      | Details                                                                                                                                                                  |      |          | Min    | Max   |                   |
| <u>Subgroup 1</u>                       |             |                                                                                                                                                                          | 5    |          |        |       |                   |
| Visual and mechanical examination       | 2071        |                                                                                                                                                                          |      | ---      | ---    | ---   | ---               |
| <u>Subgroup 2</u>                       |             |                                                                                                                                                                          | 5    |          |        |       |                   |
| Forward voltage (see 4.7.1)             | 4011        | $i_f = 10 \text{ ma(pk)}$ (pulsed)                                                                                                                                       |      | $v_f$    | ---    | 1.0   | v(pk)             |
| Forward voltage (see 4.7.1)             | 4011        | $i_f = 50 \text{ ma(pk)}$ (pulsed)                                                                                                                                       |      | $v_f$    | ---    | 2.0   | v(pk)             |
| Reverse current                         | 4016        | DC method; $V_R = 20 \text{ Vdc}$                                                                                                                                        |      | $I_R$    | ---    | 0.025 | $\mu\text{A dc}$  |
| Reverse current                         | 4016        | DC method; $V_R = 80 \text{ Vdc}$                                                                                                                                        |      | $I_R$    | ---    | 0.5   | $\mu\text{A dc}$  |
| Reverse recovery time                   | 4031        | Test condition B;<br>$I_F = I_R = 10 \text{ mA dc}$ ;<br>$V_R = 6 \text{ Vdc}$ ; $i_{rr} = 1.0 \text{ mA}$ ;<br>$R_L = 100 \text{ ohms} \pm 5\%$ ;<br>$C = 5 \text{ pf}$ |      | $t_{rr}$ | ---    | 4.0   | nsec              |
| Capacitance                             | 4001        | $V_R = 0$ ; $V_{sig} = 50 \text{ mv(p-p)}$ ,<br>max; $f = 1 \text{ MHz}$                                                                                                 |      | C        | ---    | 2.0   | pf                |
| Reverse current at peak reverse voltage | 4016        | AC method; $v_r = 100 \text{ v(pk)}$                                                                                                                                     |      | $i_r$    | ---    | 100   | $\mu\text{a(pk)}$ |
| Reverse current                         | 4016        | DC method; $T_A = 150^\circ\text{C}$ ;<br>$V_R = 20 \text{ Vdc}$                                                                                                         |      | $I_R$    | ---    | 30    | $\mu\text{A dc}$  |

TABLE II. Group B inspection

| Examination or test                             | MIL-STD-750 |                                                                                                                            | LTPD | Symbol | Limits |     | Unit  |
|-------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------|------|--------|--------|-----|-------|
|                                                 | Method      | Details                                                                                                                    |      |        | Min    | Max |       |
| <u>Subgroup 1</u>                               |             |                                                                                                                            | 10   |        |        |     |       |
| Physical dimensions                             | 2066        | (See figure 1)                                                                                                             |      | ---    | ---    | --- | ---   |
| <u>Subgroup 2</u>                               |             |                                                                                                                            | 10   |        |        |     |       |
| Solderability                                   | 2026        |                                                                                                                            |      | ---    | ---    | --- | ---   |
| Thermal shock (temperature cycling) (see 4.7.2) | 1051        | Test condition C2;<br>50 cycles                                                                                            |      | ---    | ---    | --- | ---   |
| Thermal shock (glass strain)                    | 1056        | Test condition B;<br>T(high) = +200°C<br>T(low) = -65°C                                                                    |      | ---    | ---    | --- | ---   |
| Terminal strength (tension)                     | 2036        | Test condition A;<br>weight = 16 oz;<br>t = 15 ± 3 sec                                                                     |      | ---    | ---    | --- | ---   |
| Moisture resistance                             | 1021        | No initial conditioning                                                                                                    |      | ---    | ---    | --- | ---   |
| End points:<br>Forward voltage (see 4.7.1)      | 4011        | $i_f = 10 \text{ ma(pk)}$ (pulsed)                                                                                         |      | $v_f$  | ---    | 1.0 | v(pk) |
| Reverse current                                 | 4016        | DC method; $V_R = 80 \text{ Vdc}$                                                                                          |      | $I_R$  | ---    | 0.5 | μAdc  |
| Capacitance                                     | 4001        | $V_R = 0$ ; $V_{sig} = 5 \text{ mv(p-p)}$ ,<br>max; $f = 1 \text{ MHz}$                                                    |      | C      | ---    | 2.0 | pf    |
| <u>Subgroup 3</u>                               |             |                                                                                                                            | 10   |        |        |     |       |
| Shock                                           | 2016        | Nonoperating; 1,500 G;<br>$t_p = 0.5 \text{ msec}$ ; 3 blows<br>each in orientations: $X_1$ ,<br>$Y_1$ , (total - 6 blows) |      | ---    | ---    | --- | ---   |
| Vibration, variable frequency                   | 2056        | Nonoperating;<br>orientations $X_1$ , $Y_1$                                                                                |      | ---    | ---    | --- | ---   |
| Constant acceleration                           | 2006        | Nonoperating; 20,000 G;<br>orientations $X_1$ , $Y_1$                                                                      |      | ---    | ---    | --- | ---   |
| End points:<br>(Same as subgroup 2)             |             |                                                                                                                            |      |        |        |     |       |
| <u>Subgroup 4</u>                               |             |                                                                                                                            | 10   |        |        |     |       |
| Terminal strength (lead fatigue) (see 4.7.3)    | 2036        | Test condition E;<br>weight = 4 oz                                                                                         |      | ---    | ---    | --- | ---   |
| End points:<br>(Same as subgroup 2)             |             |                                                                                                                            |      |        |        |     |       |
| <u>Subgroup 5</u>                               |             |                                                                                                                            | 10   |        |        |     |       |
| Salt spray (corrosion)                          | 1046        | Test condition B                                                                                                           |      | ---    | ---    | --- | ---   |
| End points:<br>(Same as subgroup 2)             |             |                                                                                                                            |      |        |        |     |       |

TABLE II. Group B inspection - Continued

| Examination or test                     | MIL-STD-750 |                                                                                                                  | LTPD          | Symbol | Limits |     | Unit |
|-----------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------|---------------|--------|--------|-----|------|
|                                         | Method      | Details                                                                                                          |               |        | Min    | Max |      |
| <u>Subgroup 6</u>                       |             |                                                                                                                  | 10            |        |        |     |      |
| Surge current                           | 4066        | Ten 1/120-sec surges at 1 minute intervals;<br>$I_f(\text{surge}) = 500 \text{ ma}$ ;<br>$I_o = 50 \text{ mAdc}$ |               | ---    | ---    | --- | ---  |
| End points:<br>(Same as subgroup 2)     |             |                                                                                                                  |               |        |        |     |      |
| <u>Subgroup 7</u>                       |             |                                                                                                                  | $\lambda = 5$ |        |        |     |      |
| High-temperature life (nonoperating)    | 1031        | $T_A = +200^\circ \text{C}$                                                                                      |               | ---    | ---    | --- | ---  |
| End points:<br>(Same as subgroup 2)     |             |                                                                                                                  |               |        |        |     |      |
| <u>Subgroup 8</u>                       |             |                                                                                                                  | $\lambda = 5$ |        |        |     |      |
| Steady-state operation life (see 4.7.4) | 1026        | $V_R = 60 \text{ v(pk)}$ ;<br>$I_o = 50 \text{ mAdc}$ ; $f = 60 \text{ Hz}$                                      |               | ---    | ---    | --- | ---  |
| End points:<br>(Same as subgroup 2)     |             |                                                                                                                  |               |        |        |     |      |

TABLE III. Group C inspection

| Examination or test                                       | MIL-STD-750 |                                                             | LTPD | Symbol | Limits |     | Unit             |
|-----------------------------------------------------------|-------------|-------------------------------------------------------------|------|--------|--------|-----|------------------|
|                                                           | Method      | Details                                                     |      |        | Min    | Max |                  |
| <u>Subgroup 1</u>                                         |             |                                                             | 10   |        |        |     |                  |
| Barometric pressure reduced (altitude operation)          | 1001        | Pressure = 8 mm Hg, min                                     |      | ---    | ---    | --- | ---              |
| Measurement during test:                                  |             |                                                             |      |        |        |     |                  |
| Reverse current                                           | 4016        | DC method; $V_R = 80 \text{ Vdc}$ ;<br>$t = 60 \text{ sec}$ |      | $I_R$  | ---    | 0.5 | $\mu \text{Adc}$ |
| <u>Subgroup 2</u>                                         |             |                                                             | 10   |        |        |     |                  |
| Moisture resistance                                       | 1021        | Omit initial conditioning<br>50 cycles                      |      | ---    | ---    | --- | ---              |
| End points:<br>(Same as subgroup 2<br>group B inspection) |             |                                                             |      |        |        |     |                  |

## 5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery. Preparation for delivery shall be in accordance with MIL-S-19500.

## 6. NOTES

6.1 Notes. The notes specified in MIL-S-19500 are applicable to this specification.

6.2 Deleted type. Type 1N4373 has been deleted from this specification. (EIA lists type 1N4373.)

6.3 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

### Custodians:

Army - EL  
Navy - EC  
Air Force - 11

### Preparing activity:

Army - EL

### Agent:

DSA - ES

### Review activities:

Army - MU  
Navy - SH  
Air Force - 11, 17, 85  
DSA - ES

(Project 5961-0138)

### User activities:

Army - MI, SM  
Navy - AS, OS, MC, CG  
Air Force - 13, 15, 19, 70, 80

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| SPECIFICATION ANALYSIS SHEET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 | Form Approved<br>Budget Bureau No. 22-R255 |
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| <b>INSTRUCTIONS:</b> This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements. |                 |                                            |
| SPECIFICATION <b>MIL-S-19500/195D, SEMICONDUCTOR DEVICE, DIODE, SILICON,<br/>MICRO-MINIATURE, SWITCHING TYPE 1N3206</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |                                            |
| ORGANIZATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                            |
| CITY AND STATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CONTRACT NUMBER |                                            |
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| 1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?<br>A. GIVE PARAGRAPH NUMBER AND WORDING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                                            |
| B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                            |
| 2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                            |
| 3. IS THE SPECIFICATION RESTRICTIVE?<br><input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                            |
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