



**DIODES, MICROWAVE, SILICON, PIN**

**BASED ON TYPES BXY43 AND BXY44**

**ESCC Detail Specification No. 5513/030**

|         |              |
|---------|--------------|
| Issue 7 | October 2020 |
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| DCR No. | CHANGE DESCRIPTION                                     |
|---------|--|
| 1354    | Specification upissued to incorporate changes per DCR. |

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## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

### 1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [5010](#)
- (b) [MIL-STD-750](#), Test Methods and Procedures for Semiconductor Devices

### 1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply.

### 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

#### 1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 551303009R

- Detail Specification Reference: 5513030
- Component Type Variant Number: 09 (as required)
- Total Dose Radiation Level Letter: R (as applicable and required) (Note 1)

#### NOTES:

1. For Variants 01, 02, 05, 06, the Total Dose Radiation Level Letter shall be omitted.

1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

| Variant Number | Based on Type | DC Reverse Voltage $V_R$ (V) | Diode Forward Voltage Characteristics | Case | Terminal Material and Finish |       | Weight max g | Total Dose Radiation Level Letter |
|----------------|---------------|------------------------------|---------------------------------------|------|------------------------------|-------|--------------|-----------------------------------|
|                |               |                              |                                       |      | Cathode                      | Anode |              |                                   |
| 01             | BXY43         | -150                         | See Para. 2.5.1                       | T    | D2                           | E2    | 0.02         | N/A                               |
| 02             | BXY43         | -150                         | See Para. 2.5.1                       | T1   | E2                           | E2    | 0.02         | N/A                               |
| 05             | BXY44         | -200                         | See Para. 2.5.1                       | T    | D2                           | E2    | 0.02         | N/A                               |
| 06             | BXY44         | -200                         | See Para. 2.5.1                       | T1   | E2                           | E2    | 0.02         | N/A                               |
| 09             | BXY43-09      | -150                         | See Para. 2.5.1                       | T1   | E2                           | E2    | 0.02         | R [100krad(Si)]                   |
| 10             | BXY44-10      | -200                         | See Para. 2.5.1                       | T1   | E2                           | E2    | 0.02         | R [100krad(Si)]                   |

The terminal material and finish shall be in accordance with the requirements of ESCC Basic Specification No. [23500](#).

The total dose radiation level letter shall be as defined in ESCC Basic Specification No. [22900](#). If an alternative radiation test level is specified in the Purchase Order the letter shall be changed accordingly.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

| Characteristics   | Symbols       | Maximum Ratings          | Units        | Remarks   |
|---|---------------|--------------------------|--------------|---|
| DC Reverse Voltage<br>Variants 01, 02, 09<br>Variants 05, 06, 10  | $V_R$         | -150<br>-200             | V            |   |
| Forward Current (Continuous)  | $I_F$         | 400                      | mA           |   |
| Power Dissipation<br>Variant 01<br>Variants 02, 09<br>Variant 05<br>Variants 06, 10                       | $P_D$         | 500<br>500<br>500<br>500 | mW           | $T_{case} \leq +100^\circ C$<br>$T_{case} \leq +88^\circ C$<br>$T_{case} \leq +95^\circ C$<br>$T_{case} \leq +80^\circ C$<br>Note 1 |
| Operating Temperature Range   | $T_{op}$      | -55 to +150              | $^\circ C$   | $T_{case}$  |
| Storage Temperature Range   | $T_{stg}$     | -65 to +175              | $^\circ C$   |   |
| Soldering Temperature   | $T_{sol}$     | +235                     | $^\circ C$   | Note 2  |
| Junction Temperature  | $T_j$         | +150                     | $^\circ C$   |   |
| Thermal Resistance,<br>Junction-to-Case<br>Variant 01<br>Variants 02, 09<br>Variant 05<br>Variants 06, 10 | $R_{th(j-c)}$ | 100<br>125<br>110<br>140 | $^\circ C/W$ |   |

**NOTES:**

- For  $T_{case}$  greater than specified, derate linearly to 0W at  $T_{case} = +150^\circ C$ .
- Duration 5 seconds maximum and the same termination shall not be resoldered until 5 minutes have elapsed.

1.6 HANDLING PRECAUTIONS

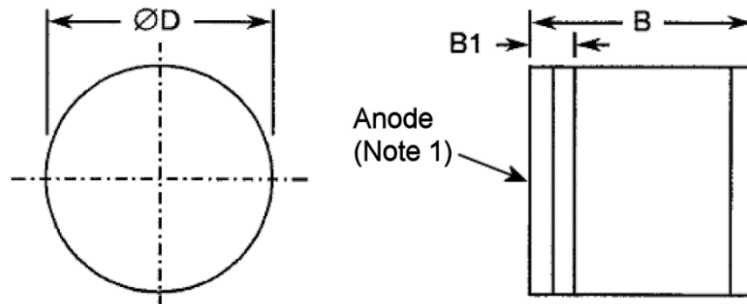
These devices are susceptible to damage by electrostatic discharge. Therefore suitable precautions shall be employed for protection during all phases of manufacture test, packaging, shipping and handling.

These components are categorised as follows:

- Variants 01, 02 are Class 1 per ESCC Basic Specification No. [23800](#) with a Minimum Critical Path Failure Voltage of 550V.
- Variant 09 is Class 1 per ESCC Basic Specification No. [23800](#) with a Minimum Critical Path Failure Voltage of 250V
- Variants 05, 06, 10 are Class 2 per ESCC Basic Specification No. [23800](#) with a Minimum Critical Path Failure Voltage of 1.2kV.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.7.1 Case Type T



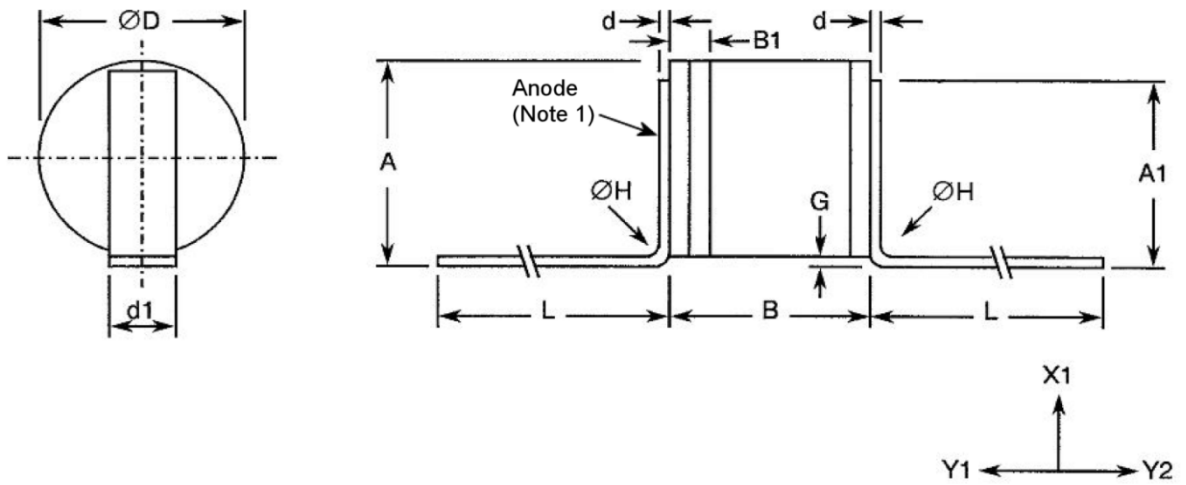
| Symbols | Dimensions mm |      | Notes |
|---------|---------------|------|-------|
|         | Min           | Max  |       |
| B       | 1.15          | 1.35 |       |
| B1      | -             | 0.4  | 1     |
| ØD      | 1.3           | 1.45 |       |

**NOTES:**

1. The anode terminal is identified by the sealing ring and lid (dimension B1).



1.7.2 Case Type T1



| Symbols         | Dimensions mm |      | Notes |
|-----------------|---------------|------|-------|
|                 | Min           | Max  |       |
| A               | 1.4           | 1.95 |       |
| A1              | 1.05          | 1.25 |       |
| B               | 1.15          | 1.35 |       |
| B1              | -             | 0.4  | 1     |
| d               | 0.06          | 0.1  |       |
| d1              | 0.4           | 0.6  |       |
| $\varnothing D$ | 1.3           | 1.45 |       |
| G               | 0.1           | 0.5  |       |
| $\varnothing H$ | -             | 0.3  |       |
| L               | 5.5           | -    |       |

**NOTES:**

1. The anode terminal is identified by the sealing ring and lid (dimension B1).

1.8 FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

1.9 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

- (a) Case  
The case shall be hermetically sealed, have a ceramic body and a metal sealing ring and lid.
- (b) Terminals  
As specified in Para. 1.4.2 Component Type Variants.

## 2 REQUIREMENTS

### 2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

#### 2.1.1 Deviations from the Generic Specification

##### 2.1.1.1 *Deviations from Screening Tests - Chart F3*

(a) Radiographic Inspection: shall be performed in the X and Z axes only.

##### 2.1.1.2 *Deviations from Qualification and Periodic Tests - Chart F4*

(a) Mechanical Shock: Not applicable.

(b) Vibration: Not applicable.

(c) Constant Acceleration: Not applicable.

### 2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#). The information to be marked and the order of precedence shall be as follows:

(a) The ESCC qualified components symbol (for ESCC qualified components only).

(b) The ESCC Component Number (see Para. 1.4.1).

(c) Traceability information.

### 2.3 DIE SHEAR

In those cases where package clearances are such that a die shear test is not practicable, the die shall be pushed away with a suitable tool. The force required to remove the die need not be recorded. The die attachment area shall be inspected and the component shall be considered acceptable if more than 50% of the semiconductor material remains.

### 2.4 TERMINAL STRENGTH

The test conditions for Terminal Strength, tested as specified in the ESCC Generic Specification, shall be as follows:

- Variants 02, 06, 09, 10: Test Condition A, tension, with a force of 1.5N and a duration of 5s.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

2.5.1 Room Temperature Electrical Measurements

The measurements shall be performed at  $T_{amb} = +25 \pm 3^{\circ}\text{C}$ .

| Characteristics         | Symbols  | MIL-STD-750<br>Test Method | Test Conditions   | Limits             |                        | Units    |
|-------------------------|----------|----------------------------|---|--------------------|------------------------|----------|
|                         |          |                            |   | Min                | Max                    |          |
| Reverse Current 1       | $I_{R1}$ | 4016                       | $V_R = -150\text{V}$<br>Variants 01, 02, 09   | -                  | 100                    | nA       |
|                         |          |                            | $V_R = -200\text{V}$<br>Variants 05, 06, 10   | -                  | 100                    |          |
| Reverse Current 2       | $I_{R2}$ | 4016                       | $V_R = -100\text{V}$<br>Variants 01, 02, 09<br>Variants 05, 06, 10  | -<br>-             | 10<br>5                | nA       |
| Forward Voltage         | $V_F$    | 4011                       | $I_F = 100\text{mA}$<br>Variants 01, 02, 09<br>Variants 05, 06, 10  | -<br>-             | 1<br>1.05              | V        |
| Total Capacitance       | $C_T$    | 4001                       | $V_R = -50\text{V}, f = 1\text{MHz}$<br>Variants 01, 02, 09<br>Variants 05, 06, 10                              | -<br>-             | 0.45<br>0.35           | pF       |
| Forward Resistance 1    | $r_{f1}$ | 4056                       | $f = 100\text{MHz}$<br>$I_{F1} = 20\mu\text{A}$<br>Variants 01, 02<br>Variant 09                                | -<br>-             | 70<br>80               | $\Omega$ |
|                         |          |                            | $I_{F1} = 10\mu\text{A}$<br>Variants 05, 06<br>Variant 10   | 800<br>500         | 1300<br>800            |          |
| Forward Resistance 2    | $r_{f2}$ | 4056                       | $f = 100\text{MHz}$<br>$I_{F2} = 1\text{mA}$<br>Variants 01, 02<br>Variants 05, 06<br>Variant 09<br>Variant 10  | -<br>12<br>-<br>8  | 3<br>28<br>3.2<br>14   | $\Omega$ |
| Forward Resistance 3    | $r_{f3}$ | 4056                       | $f = 100\text{MHz}$<br>$I_{F3} = 10\text{mA}$<br>Variants 01, 02<br>Variants 05, 06<br>Variant 09<br>Variant 10 | -<br>2<br>-<br>1.8 | 1.5<br>5<br>1.7<br>2.8 | $\Omega$ |
| Charge Carrier Lifetime | $\tau_L$ | -                          | $I_F = 10\text{mA}, I_R = -6\text{mA}$<br>Note 1<br>Variants 01, 02, 09<br>Variants 05, 06, 10                  | 250<br>300         | -<br>-                 | ns       |

**NOTES:**

1. Pulsed measurement, duration =  $1\mu\text{s}$ , duty cycle  $\leq 33\%$ . The input pulse shall be provided by a suitable pulse generator with  $t_r \leq 5\text{ns}$ .

$\tau_L$  is measured across the 50%  $I_R$  points of the output waveform.

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed only at  $T_{amb} = +100 (+0 -5)^{\circ}C$ .

| Characteristics   | Symbols  | MIL-STD-750<br>Test Method | Test Conditions<br>(Note 1) | Limits |     | Units |
|-------------------|----------|----------------------------|-----------------------------|--------|-----|-------|
|                   |          |                            |                             | Min    | Max |       |
| Reverse Current 2 | $I_{R2}$ | 4016                       | $V_R = -100V$               | -      | 250 | nA    |

**NOTES:**

- Measurements shall be performed on a sample of 5 components. In the event of any failure a 100% inspection shall be performed.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +25 \pm 3^{\circ}C$ .

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1 Room Temperature Electrical Measurements.

The drift values ( $\Delta$ ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Characteristics  | Symbols  | Limits                         |                   |                      | Units    |
|--|----------|--------------------------------|-------------------|----------------------|----------|
|  |          | Drift<br>Value (1)<br>$\Delta$ | Absolute          |                      |          |
|  |          |                                | Min               | Max                  |          |
| Reverse Current 2<br>Variants 01, 02, 09<br>Variants 05, 06, 10                        | $I_{R2}$ | $\pm 3$                        | -<br>-            | 10<br>5              | nA       |
| Forward Voltage<br>Variants 01, 02, 09<br>Variants 05, 06, 10                          | $V_F$    | $\pm 0.03$                     | -<br>-            | 1<br>1.05            | V        |
| Forward Resistance 2<br>Variants 01, 02<br>Variants 05, 06<br>Variant 09<br>Variant 10 | $r_{f2}$ | $\pm 15\%$                     | -<br>12<br>-<br>8 | 3<br>28<br>3.2<br>14 | $\Omega$ |

**NOTES:**

- $\Delta 1 = \Delta 2$ .

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +25 \pm 3^{\circ}C$ .

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1 Room Temperature Electrical Measurements.

The limit values for each characteristic shall not be exceeded.

| Characteristics   | Symbols  | Limits |                       | Units | Remarks                              |
|-------------------|----------|--------|-----------------------|-------|--------------------------------------|
|                   |          | Min    | Max                   |       |                                      |
| Reverse Current 1 | $I_{R1}$ | -      | 100<br>500            | nA    | Note 1<br>Note 2                     |
| Reverse Current 2 | $I_{R2}$ | -      | 10<br>100<br>5<br>100 | nA    | Note 1<br>Note 2<br>Note 1<br>Note 2 |
| Forward Voltage   | $V_F$    | -      | 1<br>1.05             | V     |                                      |

**NOTES:**

- Limits applicable to testing during the Endurance Subgroup of Chart F4A in the Generic Specification.
- Limits applicable to testing during the Environmental/Mechanical Subgroup of Chart F4A in the Generic Specification.

2.8 BURN-IN 1 CONDITIONS

| Characteristics     | Symbols   | Test Conditions                | Units       |
|---------------------|-----------|--------------------------------|-------------|
| Ambient Temperature | $T_{amb}$ | +150 (+0 -5)                   | $^{\circ}C$ |
| Reverse Voltage     | $V_R$     | -120 (Note 1)<br>-160 (Note 1) | V           |

**NOTES:**

- After the burn-in period, the components shall be allowed to cool until  $T_{amb} = +25 \pm 3^{\circ}C$ ; the  $V_R$  bias shall be maintained until  $T_{amb} < +35^{\circ}C$ .

2.9 BURN-IN 2 CONDITIONS

| Characteristics      | Symbols | Test Conditions (Note 1)                        | Units       |
|----------------------|---------|---|-------------|
| Junction Temperature | $T_j$   | +150 (+0 -5)                                    | $^{\circ}C$ |
| Power Dissipation    | $P_D$   | $\leq P_D$ given in Para.1.5<br>Maximum Ratings | mW          |

**NOTES:**

- $T_{case}$  shall be adjusted to attain the specified  $T_j$ .

2.10 OPERATING LIFE CONDITIONS

The conditions shall be as specified in Para. 2.9 for Burn-in 2.

2.11 TOTAL DOSE RADIATION TESTING (VARIANTS 09, 10 ONLY)

2.11.1 Bias Conditions and Total Dose Level for Total Dose Radiation Testing

Continuous bias shall be applied during irradiation testing as specified below:

- Ambient Temperature: +25 ±3°C
- Reverse Voltage:
  - For Variant 09: -120V
  - For Variant 10: -160V

The total dose level applied shall be as specified in Para. 1.4.2 Component Type Variants or in the Purchase Order.

2.11.2 Electrical Measurements for Total Dose Radiation Testing

Prior to irradiation testing, the devices shall have successfully met Para. 2.5.1 Room Temperature Electrical Measurements.

Unless otherwise stated the measurements shall be performed at  $T_{amb} = +25 \pm 3^{\circ}C$ .

The parameters to be measured during and on completion of irradiation testing are shown below.

| Characteristics                               | Symbols         | MIL-STD-750<br>Test Method | Test Conditions                                  | Limits |        | Units |
|---|-----------------|----------------------------|--|--------|--------|-------|
|   |                 |                            |  | Min    | Max    |       |
| Reverse Current 2<br>Variant 09<br>Variant 10 | I <sub>R1</sub> | 4016                       | V <sub>R</sub> = -100V                           | -<br>- | 1<br>1 | μA    |
| Reverse Current 3<br>Variant 09<br>Variant 10 | I <sub>R3</sub> | 4016                       | V <sub>R</sub> = -120V<br>V <sub>R</sub> = -160V | -<br>- | 5<br>5 | μA    |

**APPENDIX A**

**AGREED DEVIATIONS FOR INFINEON TECHNOLOGIES AG (D)**

| Items Affected  | Description of Deviations   |
|---|---|
| Para. 1.4.2 Component Type Variants   | <p>The following note applies:<br/>           Variants 01, 02, 05, 06 originate from a 4 inch wafer process.<br/>           Variants 09, 10 originate from a 6 inch wafer process.</p>  |
| Para. 2.1.1 Deviations from Generic Specification: Special In-Process Controls - Chart F2 | <p>Bond Strength: The following pre-seal bond strength shall apply:</p> <ul style="list-style-type: none"> <li>• 0.05N minimum</li> </ul>   |
|   | <p>Dimension Check: May be performed during Chart F3 testing.</p>   |
| Para. 2.1.1 Deviations from Generic Specification: Final Customer Source Inspection       | <p>Final Customer Source Inspection shall be limited to witnessing of the DC parameters specified in Para. 2.5.1 Room Temperature Electrical Measurements.</p>  |
| Para. 2.1.1 Deviations from Generic Specification: Data Documentation                     | <p>Additional Documentation and Wafer Lot Acceptance Data:<br/>           If Wafer Lot Acceptance Data is stipulated in the Purchase Order, such data will not be delivered but will be available for review at Infineon Technologies AG.</p>   |
| Para. 2.1.1.1 Deviations from Screening Tests - Chart F3                                  | <p>The following additional screening may be performed at any point prior to initial Room Temperature Electrical Measurements in Chart F3:<br/><br/>           Pre-Burn-in in accordance with <a href="#">MIL-STD-750, Test Method 1039</a>, Test Condition A, with other Test Conditions as specified in Para. 0 Burn-in 1 Conditions.</p> <ul style="list-style-type: none"> <li>• Duration: ≥ 72 hours.</li> </ul>   |
|   | <p>Temperature Cycling: Shall be replaced by a Thermal Shock test in accordance with <a href="#">MIL-STD-202, Test Method 107</a>, Test Condition B, 20 cycles.</p>   |
| Para. 2.1.1.2 Deviations from Qualification and Periodic Tests - Chart F4                 | <p>Temperature Cycling: Shall be replaced by a Thermal Shock test in accordance with <a href="#">MIL-STD-202, Test Method 107</a>, Test Condition B, 100 cycles.</p>  |
|   | <p>Assembly Capability Subgroup tests: In addition to the permitted use of empty packages or electrical rejects as test samples, components rejected during the following Screening Tests:</p> <ul style="list-style-type: none"> <li>• Radiographic Inspection</li> <li>• Seal</li> <li>• External Visual Inspection</li> </ul> <p>may be used on the condition that the cause for rejection has no possible impact on the tests, and they have been subjected to the same screening as the packages of the assembly lot with which they are associated.</p> |
|   | <p>Bond Strength: The following post-seal bond strength shall apply:</p> <ul style="list-style-type: none"> <li>• 0.04N minimum</li> </ul>  |