ESCC
European Space Components Coordination

Pages 1 to 19

# DIODES, MICROWAVE, SILICON, SCHOTTKY, GENERAL PURPOSE, BASED ON TYPES BAS40 AND BAS70

## ESCC Detail Specification No. 5512/020

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| DCR No. | CHANGE DESCRIPTION |
|---|---|
| 22<br>24<br>25 | Specification upissued to incorporate editorial and technical changes per DCRs. |

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## 1. GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Diodes, Microwave, Silicon, General Purpose, based on Types BAS40 and BAS70. It shall be read in conjunction with ESCC Generic Specification No. 5010, the requirements of which are supplemented herein.

### 1.2 COMPONENT TYPE VARIANTS

Variants of the basic type components specified herein, which are also covered by this specification are given in Table 1(a).

### 1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the components specified herein, are as scheduled in Table 1(b).

### 1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the components specified herein is shown in Figure 1.

### 1.5 PHYSICAL DIMENSIONS

The physical dimensions of the components specified herein are shown in Figure 2.

### 1.6 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification of the components specified herein, is shown in Figure 3.

### 1.7 HANDLING PRECAUTIONS

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

These components are Categorised as Class 1 with a Minimum Critical Path Failure Voltage of 1000V.

## 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 for Discrete Microwave Semiconductor Components.

(b) MIL-STD-750, Test Methods for Semiconductor Devices.

## 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. In addition, the following symbols are used:

$C_T$ = Total Capacitance.

## TABLE 1(a) - TYPE VARIANTS

| (1) VARIANT | (2) BASED ON TYPE | (3) CASE | (4) FIGURE | (5) LEAD MATERIAL AND FINISH |
|---|---|---|---|---|
| 01 | BAS70-T1 | T1 | 2 | E2 |
| 02 | Note 1 | N/A | N/A | N/A |
| 03 | BAS40-T1 | T1 | 2 | E2 |

**NOTES**

1. Type Variant 02 is discontinued (withdrawn former Type Variant BAS70B-HP)

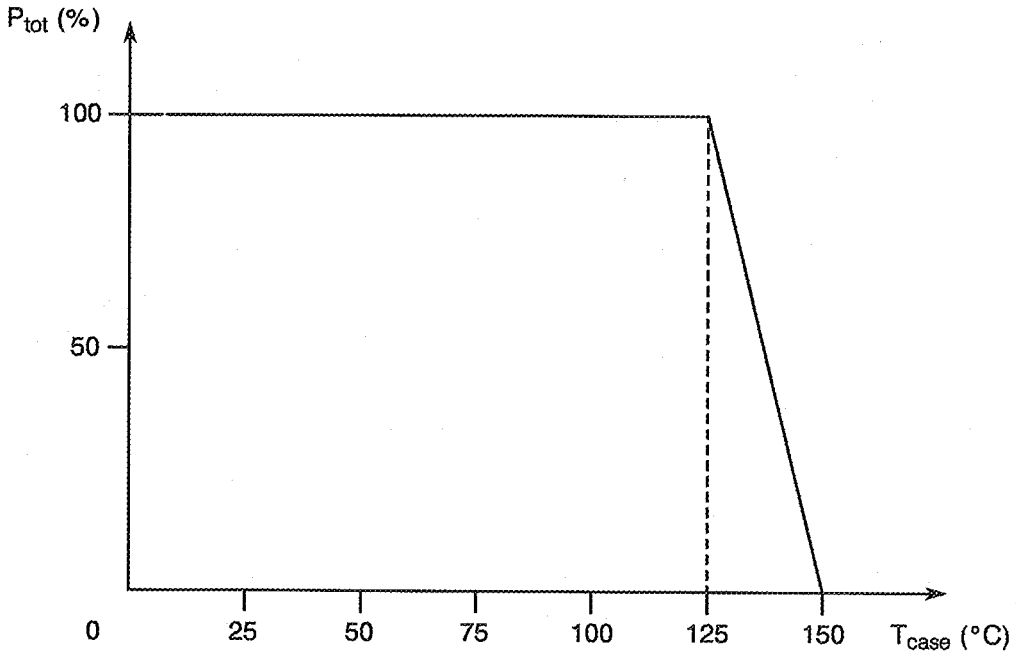
## TABLE 1(b) - MAXIMUM RATINGS

| No. | CHARACTERISTICS | SYMBOL | MAXIMUM RATINGS | UNIT | REMARKS |
|---|---|---|---|---|---|
| 1 | D.C. Reverse Voltage<br>Variant 01<br>Variant 03 | $V_R$ | <br>70<br>40 | V | |
| 2 | D.C. Forward Current<br>Variant 01<br>Variant 03 | $I_F$ | <br>70<br>120 | mA | |
| 3 | Surge Forward Current<br>Variant 01<br>Variant 03 | $I_{FSM}$ | <br>85<br>170 | mApk | Note 1 |
| 4 | Power Dissipation | $P_{tot}$ | 0.25 | W | Note 2 |
| 5 | Operating Temperature Range | $T_{op}$ | −55 to +150 | °C | $T_{case}$ |
| 6 | Storage Temperature Range | $T_{stg}$ | −55 to +150 | °C | |
| 7 | Soldering Temperature | $T_{sol}$ | +250 | °C | Note 3 |
| 8 | Junction Temperature | $T_J$ | +150 | °C | |

**NOTES**

1. $t \leq 10$ms, Duty Cycle ≈ 10%.
2. At $T_{case}$ = +125°C. For derating at $T_{case}$ > +125°C, see Figure 1.
3. Duration 5 seconds maximum at a distance of not less than 0.5mm from the device body and the same termination shall not be resoldered until 3 minutes have elapsed.

## FIGURE 1 - PARAMETER DERATING INFORMATION



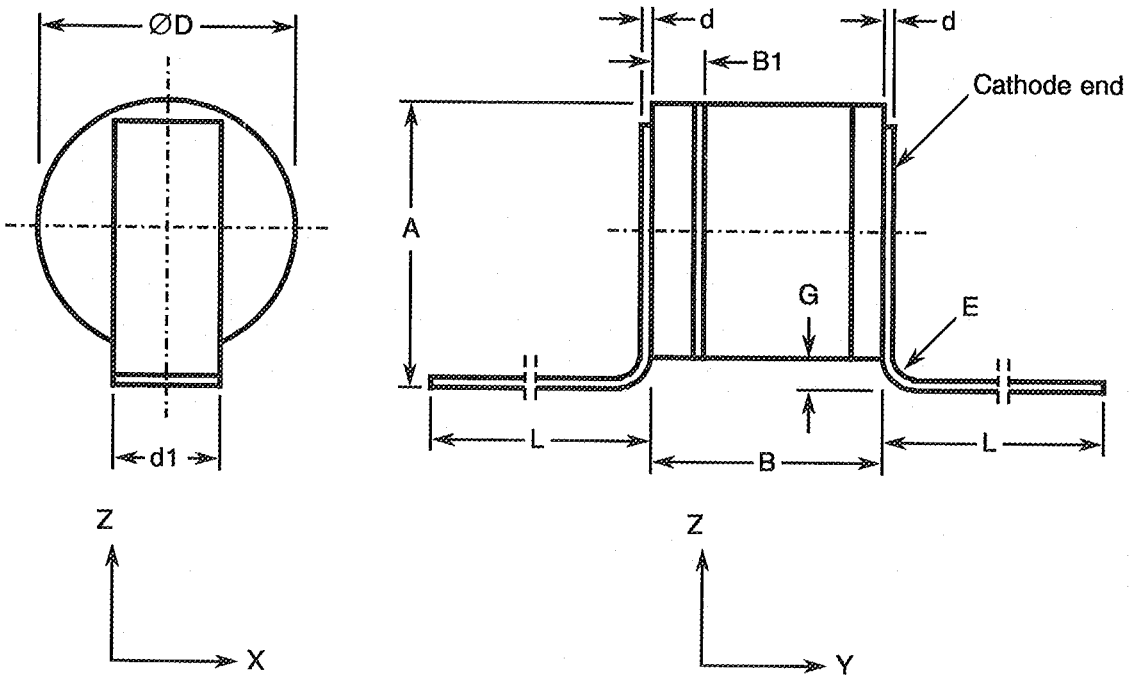

Power Dissipation versus Temperature

**NOTE**

Thermal Resistance Junction to Case $R_{TH(J-C)}$: 100°C/W.

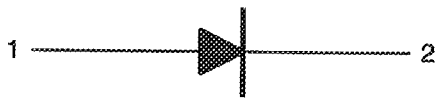
## FIGURE 2 - PHYSICAL DIMENSIONS

T1 PACKAGE




| SYMBOL | MILLIMETRES | | NOTES |
|---|---|---|---|
| | MIN | MAX | |
| A | 1.40 | 1.95 | |
| B | 1.15 | 1.35 | |
| B1 | - | 0.40 | |
| d | 0.06 | 0.10 | |
| d1 | 0.40 | 0.60 | All terminations |
| ØD | 1.30 | 1.45 | |
| E | - | 0.30 | Radius |
| G | 0.10 | 0.50 | |
| L | 5.00 | - | |

## FIGURE 3 - FUNCTIONAL DIAGRAM




1. Anode
2. Cathode

**NOTES**

1. The anode end is clearly identified by the sealing ring and lid (dimension B1 in Figure 2).

## 4. REQUIREMENTS

### 4.1 GENERAL

The complete requirements for procurement of the components specified herein shall be as stated in this specification and ESCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components. Deviations from the Generic Specification applicable to this specification only, are listed in Para. 4.2.

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

### 4.2 DEVIATIONS FROM GENERIC SPECIFICATION

#### 4.2.1 Deviations from Production Control

None.

#### 4.2.2 Deviations from Final Production Tests (Chart II(b))

(a) Para. 9.5, Thermal shock: May also be performed in accordance with MIL-STD-883, Test Method 1010, Test Condition C.

(b) Para. 9.7, Particle Impact Noise Detection (PIND) Test: May be performed at any point after the position indicated in Chart II(b), but before a final seal test, gross leak and fine leak.

(d) Para. 9.14, Vibration, Variable Frequency: Shall not be performed.

#### 4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III(a))

(a) Para. 9.9.2, Table 3 measurements: May be performed at any stage after power burn-in.

(b) Para. 9.9.3, Table 2 measurements: May be performed at any stage after power burn-in.

(c) Para. 9.12, Radiographic Inspection: Shall be performed in X and Z axes only.

#### 4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Paras. 9.8.1 and 9.8.2, Seal Test: The tests following Para. 9.15, Constant Acceleration shall not be performed.

(b) Para. 9.13, Shock Test: Shall not be performed.

(c) Para. 9.14, Vibration Test: Shall not be performed.

(d) Para. 9.15, Constant Acceleration: Shall not be performed.

(e) Para. 9.23, Special Testing: Shall not be performed.

(f) Assembly/Capability tests (Subgroup II): In addition to the permitted electrical rejects, components rejected from radiographic inspection, seal test or external visual inspection may also be used for these tests, if they are considered capable of passing the Assembly/Capability test sequence.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Paras. 9.8.1 and 9.8.2, Seal Test: The tests following Para. 9.15, Constant Acceleration shall not be performed.

(b) Para. 9.13, Shock Test: Shall not be performed.

(c) Para. 9.14, Vibration Test: Shall not be performed.

(d) Para. 9.15, Constant Acceleration: Shall not be performed.

(e) Para. 9.23, Special Testing: Shall not be performed.

(f) Assembly/Capability tests (Subgroup II): In addition to the permitted electrical rejects, components rejected from radiographic inspection, seal test or external visual inspection may also be used for these tests, if they are considered capable of passing the Assembly/Capability test sequence.

4.3 MECHANICAL AND ENVIRONMENTAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the components specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the components specified herein shall be 0.02 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be as follows:-

(a) Condition: 'A' (Tension).

(b) Force: 1.5N.

(c) Duration: 5 seconds.

4.3.4 Bond Strength

The requirements for bond strength are specified in Section 9 of ESCC Generic specification No. 5010. The test conditions shall be as follows:-

(a) Condition: 'A'.

(b) Bond Strength: 0.05N force minimum at pre-seal tests, 0.04N force minimum at post-seal tests.

4.3.5 Die Shear

The requirements for die shear are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be alternatively as follows:-

(a) Minimum acceptable die shear strength: 0.5N.

(b) In those cases where the clearances in the package do not allow application of the die shear force with a suitable tool, the chip shall be pushed away with a suitable tool and the die attach area inspected afterwards.

Sufficient die attach quality is achieved if objective evidence for sufficient mechanical and thermal contact is found, i.e. more than 50% semiconductor material remains.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the components specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material shall not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be hermetically sealed and have a ceramic body. The lid shall be welded or preform soldered.

4.4.2 Lead Material and Finish

The lead material shall be Type 'E' with Type '2' finish in accordance with the requirements of ESCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

(a) Terminal Identification.

(b) The ESCC Component Number.

(c) Traceability Information.

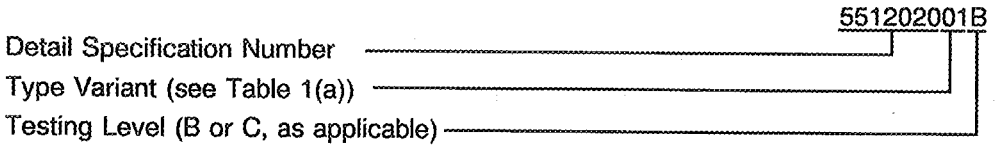
The primary package shall bear an "ESD Sensitive" label.

4.5.2 Terminal Identification

Terminal identification shall be as shown in Figures 2 and 3 of this specification.

4.5.3 The ESCC Component Number

Each component shall bear the ESCC Component Number which shall be constituted and marked as follows:




4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. Unless otherwise specified, the measurements shall be performed at $+145(+0-5)$ °C.

4.6.3 Circuits for Electrical Measurements

Not applicable.

4.7 BURN-IN TESTS

Burn-in shall be to Category 2 of Chart III(a) of ESCC Generic Specification No. 5010.

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °C. The parameter drift values ($\Delta$) applicable to the scheduled parameters shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for High Temperature Reverse Bias Burn-in

The requirements for the high temperature reverse bias burn-in are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for high temperature reverse bias burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

4.7.4 Electrical Circuit for High Temperature Reverse Bias Burn-in

The circuit for use in performing the H.T.R.B burn-in test is shown in Figure 5(a) of this specification.

4.7.5 Electrical Circuit for Power Burn-in

The circuit for use in performing the power burn-in test is shown in Figure 5(b) of this specification.

## TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - D.C. PARAMETERS

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN. | MAX. | |
| 1 | Reverse Current 1 | $I_{R1}$ | 4016 | Variant 01 $V_R = 70V$<br>Variant 03 $V_R = 40V$ | -<br>- | 2<br>2 | µA |
| 2 | Reverse Current 2 | $I_{R2}$ | 4016 | Variant 01 $V_R = 56V$<br>Variant 03 $V_R = 32V$ | -<br>- | 0.1<br>0.1 | µA |
| 3 | Forward Voltage 1 | $V_{F1}$ | 4011 | $I_F = 1mA$<br>Variant 01<br>Variant 03 | <br>0.30<br>0.29 | <br>0.44<br>0.39 | V |
| 4 | Forward Voltage 2 | $V_{F2}$ | 4011 | $I_F = 10mA$<br>Variant 01<br>Variant 03 | <br>0.60<br>0.41 | <br>0.78<br>0.54 | V |
| 5 | Forward Voltage 3 | $V_{F3}$ | 4011 | Variant 01 $I_F = 15mA$<br>Variant 03 $I_F = 40mA$ | 0.80<br>0.65 | 1.00<br>0.85 | V |
| 6 | Differential Forward Resistance | $R_{FD}$ | Note 1 | $I_{F1} = 10mA$, $I_{F2} = 15mA$<br>Variant 01<br>Variant 03 | <br>26<br>8 | <br>34<br>12 | Ω |

**NOTES**

1. $R_{FD} = \Delta V_F / \Delta I_F$.

## TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS (NOTE 1) | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN. | MAX. | |
| 7 | Total Capacitance | $C_T$ | 4001 | $V_R = 0V$, $f = 1.0MHz$<br>Oscillator level = 15mV<br>Variant 01<br>Variant 03 | <br><br>1.2<br>2.4 | <br><br>2.0<br>4.0 | pF |

## TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH TEMPERATURE

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN. | MAX. | |
| 2 | Reverse Current 2 | $I_{R2}$ | 4016 | Variant 01 $V_R = 56V$<br>Variant 03 $V_R = 32V$ | -<br>- | 100<br>200 | µA |
| 5 | Forward Voltage 3 | $V_{F3}$ | 4011 | Variant 01 $I_F = 15mA$<br>Variant 03 $I_F = 40mA$ | -<br>- | 0.95<br>0.80 | V |

## FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

## TABLE 4 - PARAMETER DRIFT VALUES

| No. | CHARACTERISTICS | SYMBOL | SPEC. AND/OR TEST METHOD | TEST CONDITIONS | CHANGE LIMITS (Δ) | UNIT |
|---|---|---|---|---|---|---|
| 2 | Reverse Current 2 | $I_{R2}$ | As per Table 2 | As per Table 2 | ±10<br>or (1)<br>+50/-33 | nA<br><br>% (2) |
| 5 | Forward Voltage 3 | $V_{F3}$ | As per Table 2 | As per Table 2 | ±5.0 | % (2) |

**NOTES**

1. Whichever is the greater.
2. Referred to the initial measurement.
3. $\Delta 1 = \Delta 2$.

## TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

| No. | CHARACTERISTICS | SYMBOL | CONDITIONS | UNIT |
|---|---|---|---|---|
| 1 | Ambient Temperature | $T_{amb}$ | +145(+0−5) | °C |
| 2 | Reverse Voltage | $V_R$ | Variant 01: 56(+0-3)<br>Variant 03: 32(+0-2) | V |

**NOTES**

1. At the end of the H.T.R.B., $T_{amb}$ shall be decreased to room temperature and the reverse bias shall remain applied until $T_{amb} <$ +35°C.

## TABLE 5(b) - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TESTS

| No. | CHARACTERISTICS | SYMBOL | CONDITIONS | UNIT |
|---|---|---|---|---|
| 1 | Junction Temperature | $T_J$ | +150(+0−5) | °C |
| 2 | Power Dissipation | $P_{tot}$ | 50(±5)<br>(Note 1) | mW |

**NOTES**

1. Because the components are mechanically clamped within the Burn-in fixture, an additional thermal resistance case to ambient, e.g. $R_{TH(C-A)}$ = 75°C/W must be considered for the calculation of $T_J$. $T_{amb}$ shall be adjusted to provide the required $T_J$.

FIGURE 5(a) - ELECTRICAL CIRCUIT FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

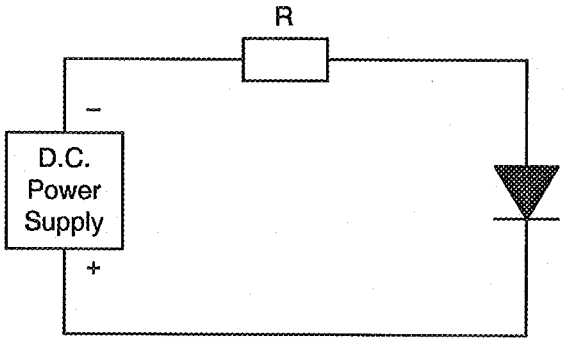
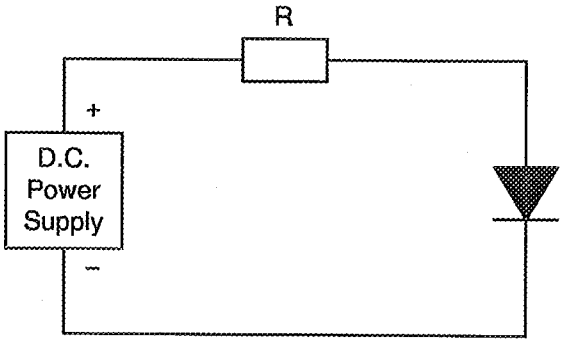



FIGURE 5(b) - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TESTS



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO.5010)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 2. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured at intermediate points and on completion of endurance tests are scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.8.3 Conditions for Operating Life Test (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.4 Electrical Circuit for Operating Life Test

The circuit for use in performing the operating life test shall be the same as shown in Figure 5(b) of this specification.

4.9 TOTAL DOSE IRRADIATION TESTING

Not applicable.

4.10 SPECIAL TESTING

Not applicable.

## TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

| No. | CHARACTERISTICS | SYMBOL | SPEC. AND/OR TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN. | MAX. | |
| 1 | Reverse Current 1 | $I_{R1}$ | As per Table 2 | As per Table 2 | - | 2.2 | µA |
| 2 | Reverse Current 2 | $I_{R2}$ | As per Table 2 | As per Table 2 | - | 0.11 | nA |
| 3 | Forward Voltage 1 | $V_{F1}$ | As per Table 2 | As per Table 2<br>Variant 01<br>Variant 03 | <br>0.29<br>0.28 | <br>0.45<br>0.40 | µA |
| 4 | Forward Voltage 2 | $V_{F2}$ | As per Table 2 | As per Table 2<br>Variant 01<br>Variant 03 | <br>0.58<br>0.39 | <br>0.80<br>0.56 | V |
| 5 | Forward Voltage 3 | $V_{F3}$ | As per Table 2 | As per Table 2<br>Variant 01<br>Variant 03 | <br>0.78<br>0.63 | <br>1.02<br>0.87 | V |
| 6 | Differential Forward Resistance | $R_{FD}$ | As per Table 2 | As per Table 2<br>Variant 01<br>Variant 03 | <br>25<br>7.5 | <br>35<br>12.5 | Ω |
| 7 | Total Capacitance | $C_T$ | As per Table 2 | As per Table 2<br>Variant 01<br>Variant 03 | <br>1.1<br>2.3 | <br>2.1<br>4.1 | pF |

## FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING

Not applicable.

## TABLE 7 - ELECTRICAL MEASUREMENTS DURING AND ON COMPLETION OF IRRADIATION TESTING

Not applicable.

## APPENDIX 'A'

AGREED DEVIATIONS FOR INFINEON TECHNOLOGIES (D)

| ITEMS AFFECTED | DESCRIPTION OF DEVIATIONS |
|---|---|
| Para. 4.2.1 | Paras. 5.2.4 and 10.5: If Wafer Lot Acceptance Test Data is specified in the purchase order, such data will not be delivered but will be available for review at Infineon Technologies. |
| Para. 4.2.3 | Para. 9.12, Radiographic Inspection: Exposure 100kV, duration 5 minutes may be used. |
| Para. 4.2.5 | Para. 8.2.3(e): Witnessing of LA3 testing by the orderer is only foreseen for the Electrical Measurements at Room Temperature. Notification of the orderer shall be performed 5 working days before the commencement of this testing. |