DIODES, MICROWAVE, SILICON, PIN

BASED ON PLANAR TYPES BXY43C AND BXY44K

ESCC Detail Specification No. 5513/030

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DCR No.	CHANGE DESCRIPTION
864	Specification upissued to incorporate technical changes per DCR.

TABLE OF CONTENTS

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Diode, Microwave, Silicon, PIN, based on Planar Types BXY43C and BXY44K. 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 diodes 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 diodes specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification, of the diodes 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 550V tor Variants 01, 02, and Class 2 with a Minimum Critical Path Failure Voltage of 1.2kV tor Variants 05, 06.

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.

TABLE 1(a) - TYPE VARIANTS

Variant	Based On Type	Figure	Terminal/Lead Material And Finish
01	BXY43C	2(a)	Cathode = D2, Anode = E2
02	BXY43C	2(b)	E2
05	BXY44K	2(a)	Cathode = D2, Anode = E2
06	BXY44K	2(b)	E2

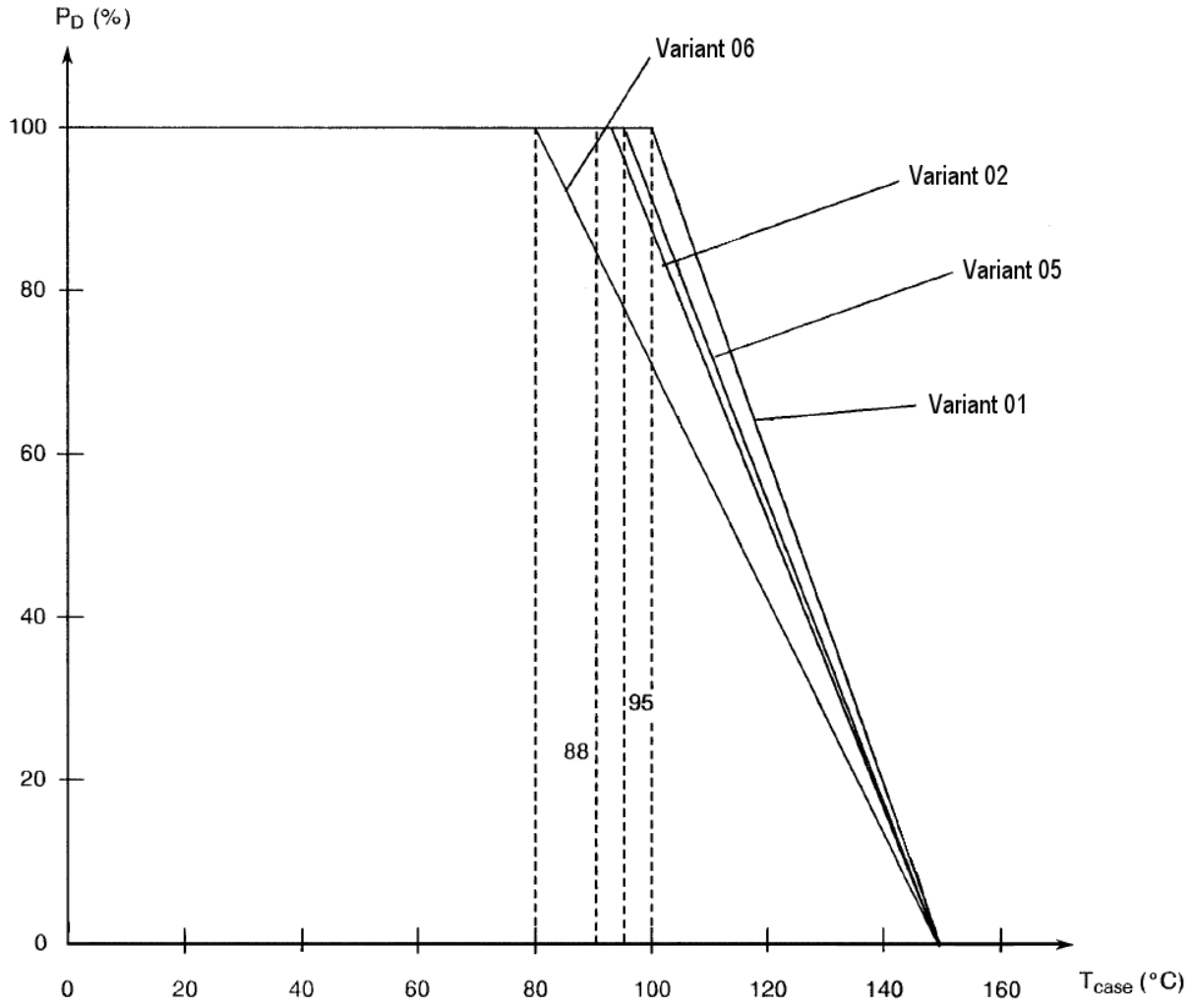
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Maximum Rating	Unit	Remarks
1	DC Reverse Voltage Variants 01, 02 Variants 05, 06	V_R	 -150 -200	V	-
2	Forward Current (Continuous)	I_F	400	mA	-
3	Power Dissipation	P_D	500	mW	Note 1
4	Operating Temperature Range	T_{op}	-55 to +150	ºC	T_{case}
5	Storage Temperature Range	T_{stg}	-65 to +175	ºC	-
6	Soldering Temperature	T_{sol}	+235	ºC	Note 2
7	Junction Temperature	T_j	+175	ºC	-
8	Thermal Resistance (Junction to Case) Variant 01 Variant 02 Variant 05 Variant 06	$R_{th(j-c)}$	 100 125 110 140	ºC/W	I_F = 1.0mA

NOTES:

1. For derating, see Figure 1.
2. Duration 5 seconds maximum and the same termination shall not be resoldered until 5 minutes have elapsed.

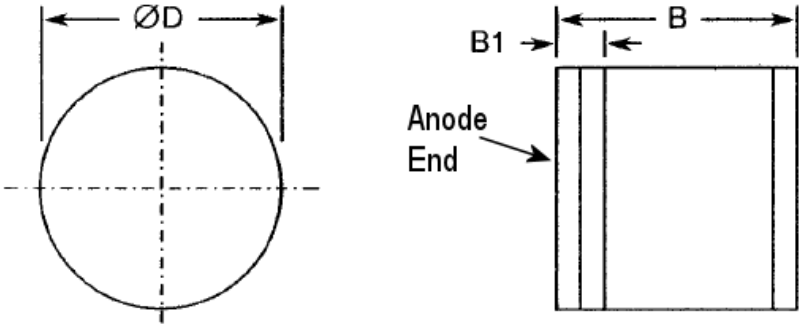
FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

FIGURE 2(a) - VARIANTS 01, 05

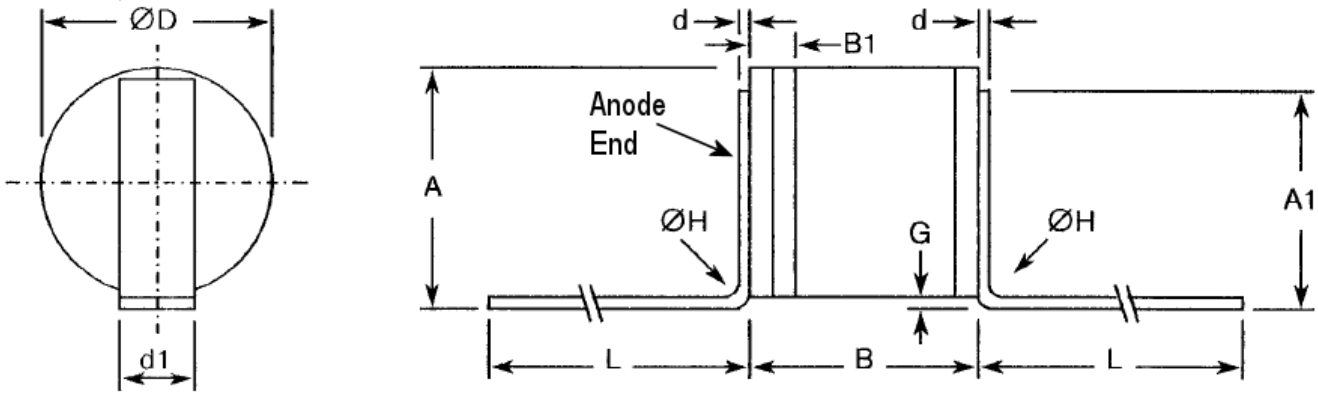


Symbol	Millimetres		Notes
	Min	Max	
B	1.15	1.35	
B1	-	0.4	1
ØD	1.3	1.45	

NOTES:

1. Terminal identification: the anode end is edentified by the sealing ring and lid (dimension B1).

FIGURE 2(b) - VARIANTS 02, 06



Symbol	Millimetres		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	
ØD	1.3	1.45	
G	0.1	0.5	
ØH	-	0.3	
L	5.5	-	

NOTES:

1. Terminal identification: the anode end is edentified by the sealing ring and lid (dimension B1).

FIGURE 3 - FUNCTIONAL DIAGRAM

1. Anode
2. Cathode

4 REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the diodes 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 Special In-process Controls

(a) Para. 5.3, Wafer Lot Acceptance: Shall be performed as an SEM Inspection only.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 6.2, Pre-burn-in: Shall be performed for 168 hours with Conditions as per Table 5(b) of this specification.
(b) Para. 9.2.2, Die Shear: Forces need not be recorded and the residual die area shall be ≥ 50% of the original die size.
(c) Para. 9.6, Constant Acceleration: Shall not be performed.
(d) Para. 9.7, Particle Impact Noise Detection (PIND) test: May be performed at any point after its position in Chart II.
(e) Para. 9.14, Vibration, Variable Frequency: Shall not be performed.

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

(a) Para. 9.1.1, Initial Parameter Drift Value Measurements: Parameters measured in Chart II shall not be repeated during Electrical Measurements at Room Temperature.
(b) Para. 9.12, Radiographic Inspection: Shall be performed in X and Z axes only, exposure 100kV, duration 5 minutes.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.2, Die Shear: Forces need not be recorded and the residual die area shall be ≥ 50% of the original die size.
(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. 9.20, Operating Life: Only one Operating Life Test shall be performed on 30 components.
(f) Para. 9.23, Special Testing: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.13, Shock Test: Shall not be performed.
(b) Para. 9.14, Vibration Test: Shall not be performed.
(c) Para. 9.15, Constant Acceleration: Shall not be performed.
(d) Para. 9.20, Operating Life: Only one Operating Life Test shall be performed on 16 components.
(e) Para. 9.23, Special Testing: Shall not be performed.

4.3 MECHANICAL AND ENVIRONMENTAL REQUIREMENTS

4.3.1 Dimension Check
The dimensions of the diodes specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight
The maximum weight of the diodes 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:

		Variants 02, 06
Test Condition	:	'A' (Tension)
Force	:	1.22 Newtons
Duration	:	5.0 seconds

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 diodes 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
Metal - Ceramic.

4.4.2 Lead Materials and Finish
The terminal and lead materials and finishes shall be as specified in Table 1(a) of this specification, 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.

4.5.2 Cathode Identification
Cathode identification shall be as shown in Figures 2 and 3 of this specification.

4.5.3 ESCC Component Number

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

Example: 551303001B

- Detail Specification Number: 5513030
- Type Variant (see Table 1(a)): 01
- Testing Level (B or C, as applicable): B

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, measurements shall be performed at T_{amb} = +25 ±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 T_{amb} = +100 (+0 -5)ºC.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Table 2 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

Burn-in shall be Category 3 of Chart III(a)

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 ±3°C. The parameter drift values (Δ) 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 7 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 Electrical Circuit for High Temperature Reverse Bias Burn-in

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

4.7.4 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 7 of ESCC Generic Specification No. 5010. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

4.7.5 Electrical Circuits for Power Burn-in

Circuits for use in performing the power burn-in tests are shown in Figure 5(b) of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - DC PARAMETERS

No.	Characteristics	Symbol	MIL-STD-750 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	Reverse Current 1	I_{R1}	4016	Variants 01, 02: V_R = -150V Variants 05, 06: V_R = -200V	- -	100 100	nA
2	Reverse Current 2	I_{R2}	4016	V_R= -100V Variants 01, 02 Variants 05, 06	 - -	 10 5	nA
3	Forward Voltage	V_F	4011	I_F = 100mA Variants 01, 02 Variants 05, 06	 - -	 1 1.05	V

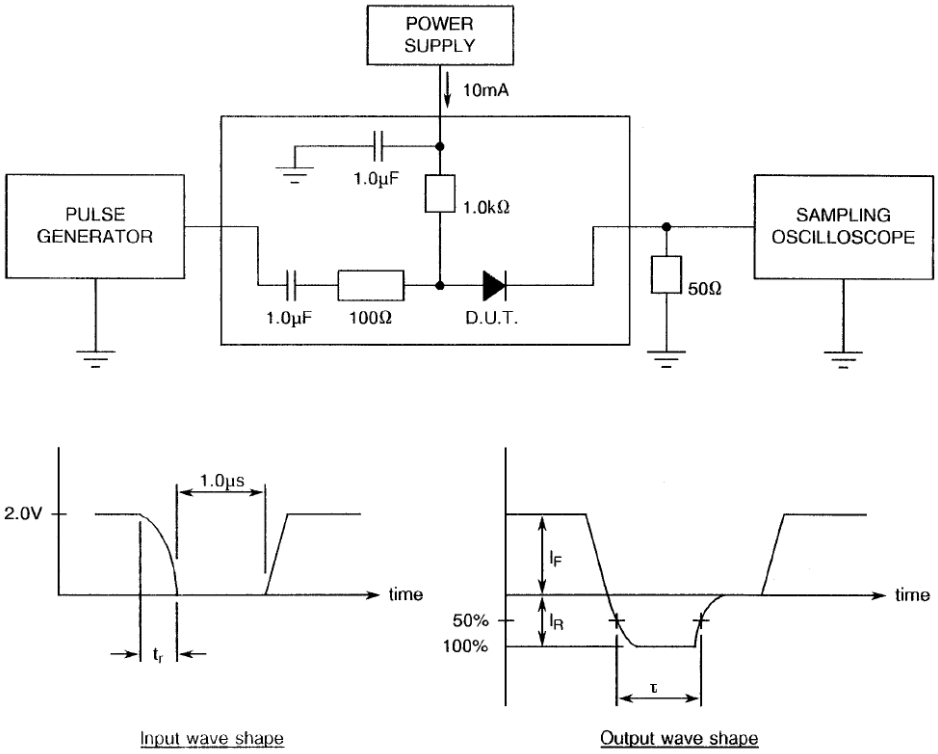
TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - AC PARAMETERS

No.	Characteristics	Symbol	MIL-STD-750 Test Method	Test Fig.	Test Conditions	Limits		Unit
						Min.	Max.	
4	Total Capacitance	C_T	4001	-	V_R = -50V f = 1.0MHz Variants 01, 02 Variants 05, 06	 - -	 0.45 0.35	pF
5	Forward Resistance 1	r_{f1}	4056	-	f = 100MHz Variants 01, 02: I_{F1} = 20µA Variants 05, 06: I_{F1} = 10µA	 - 800	 70 1300	Ω
6	Forward Resistance 2	r_{f2}	4056	-	f = 100MHz I_{F2} = 1.0mA Variants 01, 02 Variants 05, 06	 - 12	 3 28	Ω
7	Forward Resistance 3	r_{f3}	4056	-	f = 100MHz I_{F3} = 10mA Variants 01, 02 Variants 05, 06	 - 2	 1.5 5	Ω
8	Charge Carrier Lifetime	τ	-	4	I_F = 10mA I_R = -6.0mA Variants 01, 02 Variants 05, 06	 250 300	 - -	ns

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	MIL-STD-750 Test Method	Test Conditions	LIMITS		UNIT
					MIN.	MAX.	
2	Reverse Current 2	I_{R2}	4016	V_R = -100V	-	0.25	µA

FIGURE 4 - TEST CIRCUIT FOR CHARGE CARRIER LIFETIME MEASUREMENT



NOTES:

1. The value of the reverse current I_R is -6.0mA and the forward current I_F is 10mA.
2. The lifetime (τ) is measured across the 50% points of the observed wave shape. The input pulse is provided by a pulse generator having a rise time of less than 5ns. The output pulse is amplified and observed on a sampling oscilloscope.
3. Pulse length: 1.0µs.
4. Duty cycle: ≤ 33%.

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	±3 (1)	nA
3	Forward Voltage	V_F	As per Table 2	As per Table 2	±30 (1)	mV
6	Forward Resistance 2	r_{f2}	As per Table 2	As per Table 2	±15 (1)	%

NOTES:
1. Δ1 = Δ2 = Δ3.

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

No.	Characteristics	Symbol	Conditions	Unit
1	Ambient Temperature	T_{amb}	+150 (+0 -3) (Note 1)	ºC
2	Reverse Voltage Variants 01, 02 Variants 05, 06	V_R	 -120 -160	V

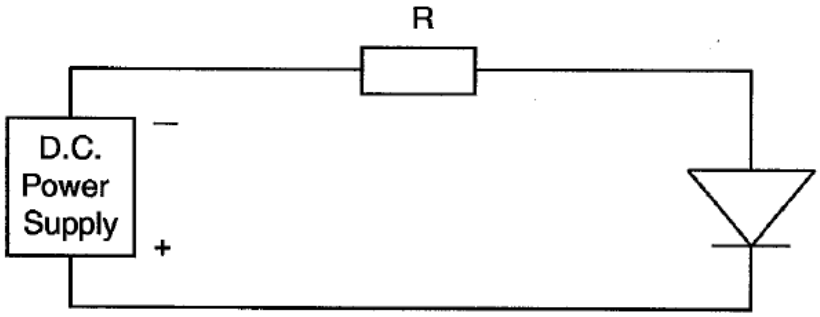
NOTES:
1. At the end of the HTRB, T_{amb} shall be decreased to room temperature and the reverse bias shall remain applied until T_{amb} is less than +35°C.

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

No.	Characteristics	Symbol	Conditions	Unit
1	Ambient Temperature Variants 01, 05 Variants 02, 06	T_{amb}	 +120 (Note 1) +130 (Note 1)	ºC
2	Junction Temperature	T_j	+150	ºC
3	Power Dissipation Variant 01, 05 Variant 02, 06	P_D	 90 65	mW

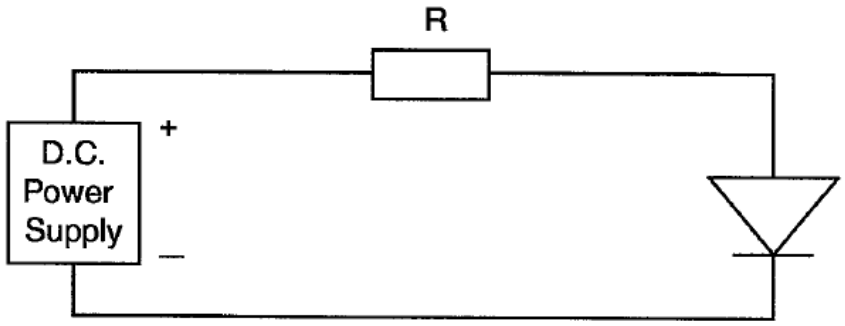
NOTES:
1. T_{amb} shall be adjusted to achieve the specified junction temperature, T_j. The following thermal resistance (junction to ambient) values, $R_{th(j-a)}$, shall be taken into account:
   - Variant 01: 325ºC/W
   - Variant 02: 275ºC/W
   - Variant 05: 335ºC/W
   - Variant 06: 290ºC/W

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



NOTES:
1. R = 22kΩ.

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



NOTES:
1. R = 3.9Ω.

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 ±3ºC.

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. Unless otherwise stated, the measurements shall be performed at T_{amb} = +25 ±3°C.

4.8.3 Conditions for Operating Life Tests (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 are specified in Table 5(b) of this specification.

4.8.4 Electrical Circuits for Operating Life Tests
The circuit to be used for performance of the operating life test shall be the same as shown in Figure 5(b) for Power Burn-in.

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	As per Table 2		nA
2	Reverse Current 2	I_{R2}	As per Table 2	As per Table 2	As per Table 2		nA
3	Forward Voltage	V_F	As per Table 2	As per Table 2	As per Table 2		V

FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING

Not applicable.

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

Not applicable.