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Pages 1 to 17

DIODES, SWITCHING

BASED ON TYPE 1N5711

ESA/SCC Detail Specification No. 5106/010



**space components
coordination group**

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		This issue incorporates all modifications agreed on the basis of Policy DCR's 21021, 21022 and 21025		
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**SCC**ESA/SCC Detail Specification
No. 5106/010

Rev. 'C'

PAGE 3

ISSUE 1

TABLE OF CONTENTS

	<u>Page</u>
1. <u>GENERAL</u>	5
1.1 Scope	5
1.2 Component Type Variants	5
1.3 Maximum Ratings	5
1.4 Parameter Derating Information	5
1.5 Physical Dimensions	5
1.6 Functional Diagram	5
1.7 High Temperature Test Precautions	5
2. <u>APPLICABLE DOCUMENTS</u>	5
3. <u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u>	9
4. <u>REQUIREMENTS</u>	9
4.1 General	9
4.2 Deviations from Generic Specification	9
4.2.1 Deviations from Special In-process Controls	9
4.2.2 Deviations from Final Production Tests (Chart II)	9
4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)	9
4.2.4 Deviations from Qualification Tests (Chart IV)	9
4.2.5 Deviations from Lot Acceptance Tests (Chart V)	9
4.3 Mechanical Requirements	10
4.3.1 Dimension Check	10
4.3.2 Weight	10
4.3.3 Terminal Strength	10
4.4 Materials and Finishes	10
4.4.1 Case	10
4.4.2 Lead Material and Finish	10
4.5 Marking	11
4.5.1 General	11
4.5.2 Lead Identification	11
4.5.3 The SCC Component Number	11
4.5.4 Traceability Information	11
4.5.5 Marking of Small Components	11
4.6 Electrical Measurements	12
4.6.1 Electrical Measurements at Room Temperature	12
4.6.2 Electrical Measurements at High and Low Temperatures	12
4.6.3 Circuits for Electrical Measurements	12



	<u>Page</u>	
4.7	Burn-in Tests	12
4.7.1	Parameter Drift Values	12
4.7.2	Conditions for Burn-in	12
4.7.3	Electrical Circuits for Burn-in	12
4.7.4	Conditions and Electrical Circuits for High Temperature Reverse Bias	12
4.8	Environmental and Endurance Tests	16
4.8.1	Electrical Measurements on Completion of Environmental Tests	16
4.8.2	Electrical Measurements at Intermediate Points and on Completion of Endurance Tests	16
4.8.3	Conditions for Operating Life Tests	16
4.8.4	Electrical Circuits for Operating Life Tests	16
4.8.5	Conditions for High Temperature Storage Test	16

TABLES

1(a)	Type Variants	6
1(b)	Maximum Ratings	6
2	Electrical Measurements at Room Temperature - d.c. Parameters	13
	Electrical Measurements at Room Temperature - a.c. Parameters	13
3	Electrical Measurements at High and Low Temperatures	15
4	Parameter Drift Values	15
5	Conditions for Burn-in	15
6	Electrical Measurements at Intermediate Points and on Completion of Endurance Testing	17

FIGURES

1	Parameter Derating Information	7
2	Physical Dimensions	8
3	Functional Diagram	8
4	Test Circuit for Measurement of Effective Carrier Lifetime	14
5	Electrical Circuits for HTRB and Burn-in	15

APPENDICES (Applicable to specific Manufacturers only)

None.

**1. GENERAL****1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for Diodes, Switching, based on Type 1N5711.

It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, 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 listed 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 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 HIGH TEMPERATURE TEST PRECAUTIONS

For tin-lead plated or solder-dipped lead finish, all tests to be performed at a temperature that exceeds +125°C shall be carried out in 100% inert atmosphere.

2. APPLICABLE DOCUMENTS

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

- (a) ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors.
- (b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.
- (c) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

**TABLE 1(a) - TYPE VARIANTS**

Variant	Type	Lead Material and Finish
01	1N5711	C3 or C4

TABLE 1(b) - MAXIMUM RATINGS

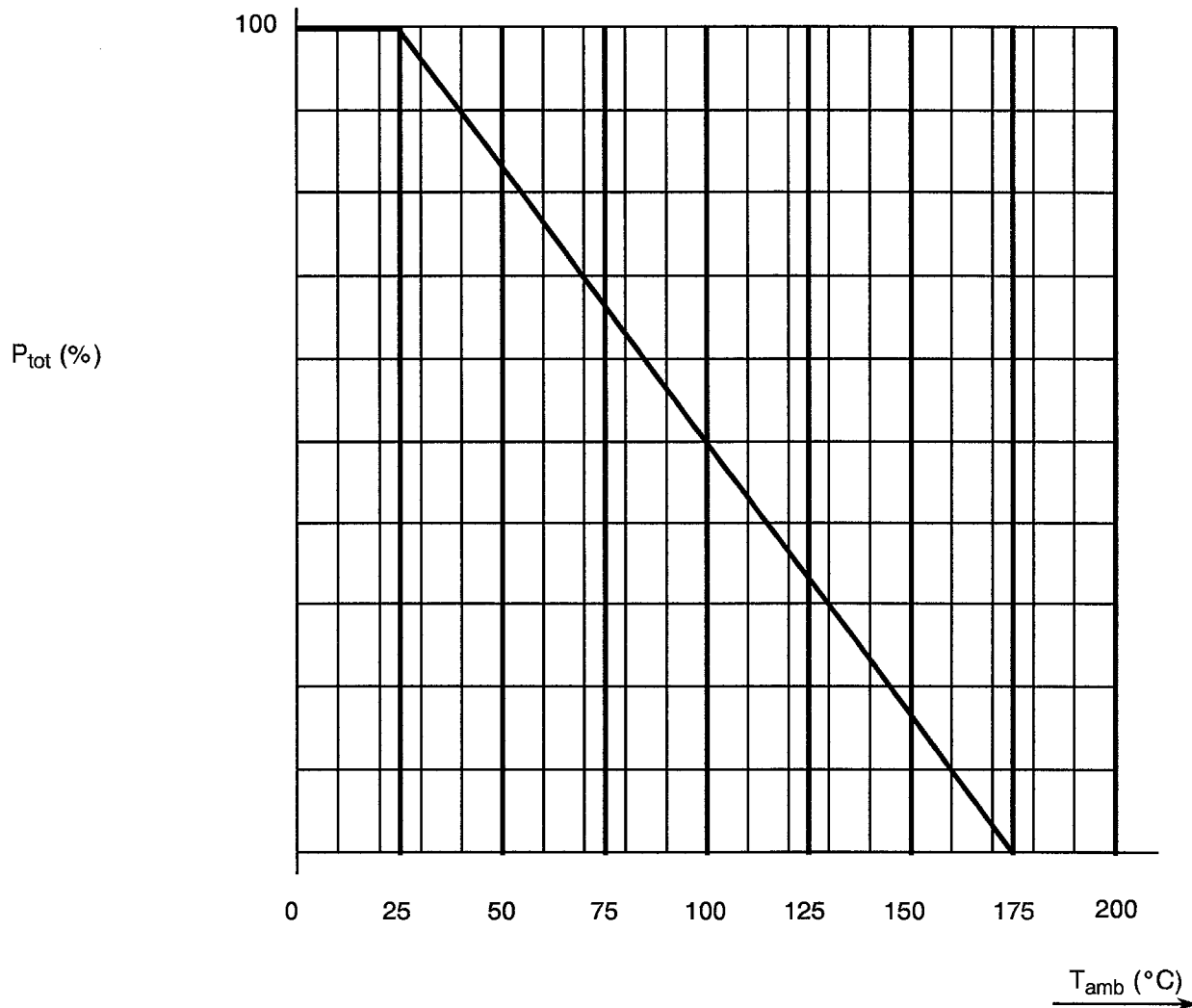
No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	DC Reverse Voltage	$V_{RM(wkg)}$	50	V_{pk}	
2	Total Power Dissipation	P_{tot}	250	mW	See Note
3	DC Forward Current	I_F	15	mA	
4	Operating Temperature Range	T_{op}	- 65 to + 175	°C	T_{amb}
5	Storage Temperature Range	T_{stg}	- 65 to + 200	°C	
6	Soldering Temperature	T_{sol}	+ 230	°C	Time: ≤ 10 seconds; Distance from case: ≥ 1.5 mm
7	Average Rectified Current	I_O	33	mA	

NOTES

1. At $T_{amb} = +25^\circ\text{C}$. For derating above this temperature, see Figure 1.



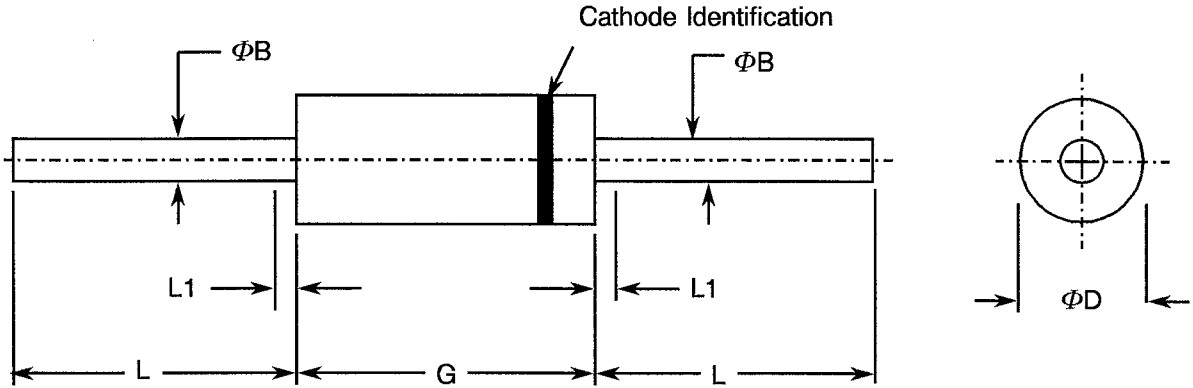
FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation versus Temperature



FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	INCHES		MILLIMETRES (3)		NOTES
	MIN.	MAX.	MIN.	MAX.	
ΦB	0.014	0.020	0.36	0.41	
ΦD	0.068	0.076	1.73	1.93	1
G	0.150	0.170	3.01	4.32	1
L	1.000	1.500	25.40	38.10	
L1	-	0.050	-	1.27	2

NOTES

1. Package contour optional within cylinder of diameter ΦD and length G. Slugs, if any, shall be included within this cylinder, but shall not be subject to the minimum limit of ΦD .
2. Lead diameter not controlled in this zone to allow for flash, lead finish build-up and minor irregularities other than slugs.
3. Dimensions in millimetres are derived from original ones in inches.



FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

NOTES

1. The cathode end shall be marked with a coloured ring.

		<p style="text-align: center;">ESA/SCC Detail Specification No. 5106/010</p>	<p style="text-align: center;">Rev. 'B'</p>	<p>PAGE 9 ISSUE 1</p>
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3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the diodes specified herein are stated in this specification and ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors. 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 ESA/SCC 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

None.

4.2.2 Deviations from Final Production Tests (Chart II)

- (a) Para. 9.2.1, Bond Strength Test: Not applicable.
- (b) Para. 9.2.2, Die-shear Test: Not applicable.
- (c) Para. 9.7, Particle Impact Noise Detection (PIND) Test: Not applicable.
- (d) Para. 9.5, Thermal Shock Test: To be performed according to MIL-STD-202, Test Method 107, Condition 'B'.

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

- (a) HTRB Test: Shall not be performed.
- (b) Radiographic Inspection: Not applicable.

4.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Bond Strength and Die-shear Tests: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.



4.3 MECHANICAL 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 0.25 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The test conditions shall be as follows:-

Test Condition : 'A'.
Applied Force : 5.0 Newtons.
Duration : 10 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 does not guarantee acceptance of the finished product.

4.4.1 Case

Glass, hermetically sealed.

4.4.2 Lead Material and Finish

The lead material shall be Type 'C' with Type '3 or 4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

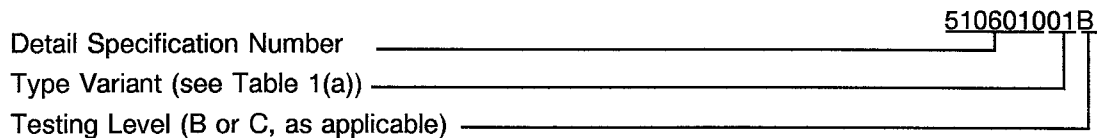
- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3.

4.5.3 The SCC Component Number

Each component shall bear the SCC 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 ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

The marking information in full shall accompany each component in its primary package.



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. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °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.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing the electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

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 $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuits for Burn-in

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

4.7.4 Conditions and Electrical Circuits for High Temperature Reverse Bias

Not applicable.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS**

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	D.C. Reverse Current	I_R	4016	$V_R = 50V$	-	200	nA
2	D.C. Forward voltage	V_F	4011	$I_F = 1.0mA$ $I_F = 15mA$	- -	0.41 1.0	V
3	Breakdown Voltage	V_{BR}	4021	$I_R = 10\mu A$	70	-	V

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
4	Capacitance	C	MIL-STD-750 Method 4001 See Note	$V_R = 0V$ $f = 1.0MHz$ $V = 50mV$ max. (p.p.)	-	2.0	pF
5	Effective Carrier Lifetime	τ	Figure 4 of this specification	$I_F = 5.0mA$ Krakauer Method	-	100	ps

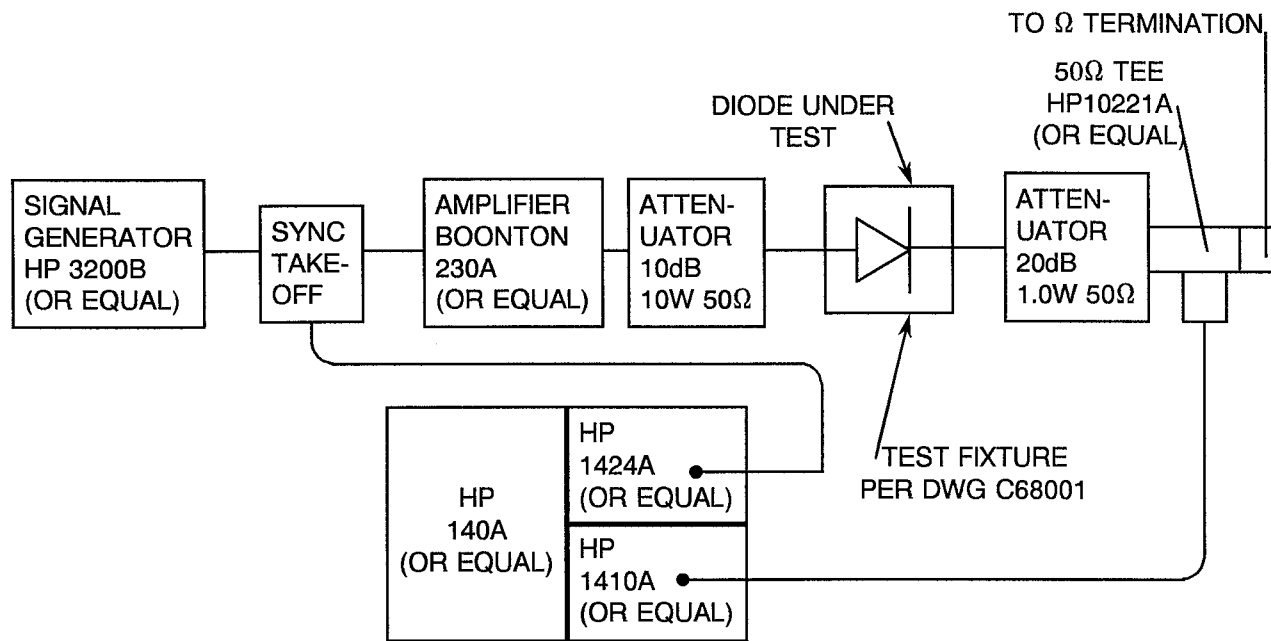
NOTES

1. Sample test AQL = 2.5%.



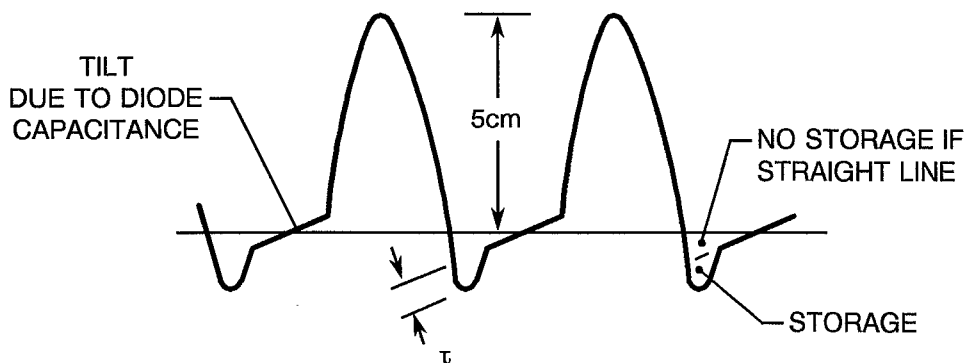
FIGURE 4 - TEST CIRCUIT FOR MEASUREMENT OF EFFECTIVE CARRIER LIFETIME

FIGURE 4(a) - TEST SET-UP FOR MEASUREMENT OF DIODE LIFETIME



This test shall be performed with the device installed in the test fixture, DESG Drawing C 68001, as per the test set-up shown in Figure 4(a). Adjust the signal generator to 54MHz and 10V output to obtain a sufficient trigger signal for the oscilloscope. Adjust the sensitivity of the oscilloscope to 10mV/cm. With the device in the test fixture, adjust the output of the amplifier until the peak amplitude of the forward current is 5.0mA_{dc} or 2.5cm as seen on the oscilloscope. Expand pattern to 5.0cm, using the sensitivity vernier. Under these conditions, the effective carrier lifetime is related to the amplitude designated as 'τ' shown in Figure 4(b). This amplitude has the calibration of 500ps/cm and is linear to 1.5cm.

FIGURE 4(b) - OSCILLOSCOPE DISPLAY IN MEASUREMENT OF DIODE LIFETIME



**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = 50V$ $T_{amb} = +150^\circ C$	-	200	μA

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
1	Forward Voltage	V_F	4011	$I_F = 1.0mA_{dc}$	± 10	%
2	Reverse Current	I_R	4016	$V_R = 50 V_{dc}$	100 or (1) ± 50	% nAdc

NOTES

1. Whichever is more referred to the initial value.

TABLE 5 - CONDITIONS FOR BURN-IN

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Working Voltage	V_r	50V (PK)	V
2	Average Rectified Current	I_o	33	mA
3	Frequency	f	50 to 60	Hz
4	Ambient Temperature	T_{amb}	+25(+0-3)	$^\circ C$

FIGURE 5 - ELECTRICAL CIRCUITS FOR HTRB AND BURN-IN

Not applicable.



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 5000)

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. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °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 testing are scheduled in Table 6.

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

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be the same as specified in Table 5 for the burn-in test.

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 for burn-in.

4.8.5 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 5000. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Forward Voltage	V_F	4011	$I_F = 15\text{mA}$	-	1.0	V
2	Reverse Current	I_R	4016	$V_R = 50\text{V}$	-	200	nA