



**DIODES, SWITCHING, SCHOTTKY BARRIER**

**BASED ON TYPE 1N5712**

**ESCC Detail Specification No. 5106/002**

**ISSUE 1**

**October 2002**



	ESCC Detail Specification		PAGE ii ISSUE 1
---	---------------------------	--	--------------------

### **LEGAL DISCLAIMER AND COPYRIGHT**

European Space Agency, Copyright © 2002. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without the prior permission of the European Space Agency and provided that it is not used for a commercial purpose, may be:

- copied in whole in any medium without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.



**european space agency  
agence spatiale européenne**

Pages 1 to 14

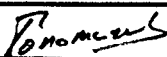
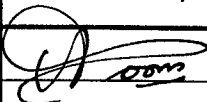
**DIODES, SWITCHING, SCHOTTKY BARRIER**

**BASED ON TYPE 1N5712**

**ESA/SCC Detail Specification No. 5106/002**



**space components  
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 2	March 1995		



**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in Revision 'A' to Issue 1 and the following DCR's:-		
		Cover Page	: Title corrected	23722
		DCN		None
		Para. 1.1	: First sentence corrected	23722
		Para. 1.4	: Existing text deleted and new text added	23722
		Para. 2	: Items (c) and (e) deleted and (d) renumbered as "(c)"	23722
		Table 1(b)	: Note 1 amended	23722
		Figure 1	: Title standardised	23722
			: Undertitle added and "2.0mW/°C" added to slope	23722
		Figure 2	: Imperial dimensions deleted	23722
		Para. 4.2.3	: Title standardised	23722
		Para. 4.2.4	: Deviation added	23722
		Para. 4.2.5	: Deviation added	23722
		Para. 4.5.1	: Existing text deleted and new text added	23722
		Para. 4.5.3	: "Type Variant" and "Testing Level" amended	23722
		Para. 4.5.5	: Deleted in toto	23722
		Para. 4.6.2	: Second sentence amended	23722
		Para. 4.7.2	: Title and text standardised	23722
		Para's. 4.7.2, 4.7.3	: Reversed in sequence	23722
		Para's. 4.7.4, 4.7.5	: Para's added	23722
		Table 2 a.c.	: No. 6, Characteristics amended	23722
		Table 3	: No. 4 deleted and No. 3 added	221182
		Figure 4(b)	: Title amended	23722
		Tables 5(a), 5(b)	: Titles amended	23722
			: Reversed in sequence	23722
		Figures 5(a), 5(b)	: References added	23722
		Para. 4.8	: Title completed	23722
		Para's. 4.8.2, 4.8.3	: Combined as 4.8.2	23722
			: All subsequent paragraphs renumbered	23722
		Para. 4.8.3	: Old Para. 4.8.4, Table corrected to "5(b)"	23722
		Para. 4.8.5	: Old Para. 4.8.6, in second sentence, text deleted and new text added	23722
		Table 6	: No. 6, Characteristics amended	23722

**TABLE OF CONTENTS**

	<u>Page</u>
<b>1. <u>GENERAL</u></b>	<b>5</b>
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 Pin Assignment	5
1.7 Functional Diagram	5
1.8 Handling Precautions	5
<b>2. <u>APPLICABLE DOCUMENTS</u></b>	<b>5</b>
<b>3. <u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u></b>	<b>5</b>
<b>4. <u>REQUIREMENTS</u></b>	<b>8</b>
4.1 General	8
4.2 Deviations from Generic Specification	8
4.2.1 Deviations from Special In-process Controls	8
4.2.2 Deviations from Final Production Tests	8
4.2.3 Deviations from Burn-in and Electrical Measurements	8
4.2.4 Deviations from Qualification Tests	8
4.2.5 Deviations from Lot Acceptance Tests	8
4.3 Mechanical Requirements	8
4.3.1 Dimension Check	8
4.3.2 Weight	8
4.4 Materials and Finishes	8
4.4.1 Case	8
4.4.2 Lead Material and Finish	9
4.5 Marking	9
4.5.1 General	9
4.5.2 Lead Identification	9
4.5.3 The SCC Component Number	9
4.5.4 Traceability Information	9
4.6 Electrical Measurements	9
4.6.1 Electrical Measurements at Room Temperature	9
4.6.2 Electrical Measurements at High and Low Temperatures	10
4.6.3 Circuits for Electrical Measurements	10
4.7 Burn-in Tests	10
4.7.1 Parameter Drift Values	10
4.7.2 Conditions for High Temperature Reverse Bias Burn-in	10
4.7.3 Conditions for Power Burn-in	10
4.7.4 Electrical Circuits for High Temperature Reverse Bias Burn-in	10
4.7.5 Electrical Circuits for Power Burn-in	10
4.8 Environmental and Endurance Tests	14
4.8.1 Electrical Measurements on Completion of Environmental Tests	14
4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests	14
4.8.3 Conditions for Operating Life Tests	14
4.8.4 Electrical Circuits for Operating Life Tests	14
4.8.5 Conditions for High Temperature Storage Test	14

**TABLES**

1(a)	Type Variants	6
1(b)	Maximum Ratings	6
2	Electrical Measurements at Room Temperature - d.c. Parameters	11
	Electrical Measurements at Room Temperature - a.c. Parameters	11
3	Electrical Measurements at High and Low Temperatures	11
4	Parameter Drift Values	13
5(a)	Conditions for High Temperature Reverse Bias Burn-in	13
5(b)	Conditions for Power Burn-in and Operating Life Tests	13
6	Electrical Measurements at Intermediate Points and on Completion of Endurance Testing	14

**FIGURES**

1	Parameter Derating Information	6
2	Physical Dimensions	7
3	Functional Diagram	7
4	Circuits for Electrical Measurements	12
5(a)	Electrical Circuit for High Temperature Reverse Bias Burn-in	13
5(b)	Electrical Circuit for Power Burn-in and Operating Life Tests	13

**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 a Diode, Switching, Schottky Barrier, based on Type 1N5712. 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 type 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 PIN ASSIGNMENT**

Not applicable.

**1.7 FUNCTIONAL DIAGRAM**

As per Figure 3.

**1.8 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.

**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) DESC Drawing C680001.

**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.



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

VARIANT	FIGURE	LEAD MATERIAL AND FINISH
01	2	C2
02	2	C3 or C4

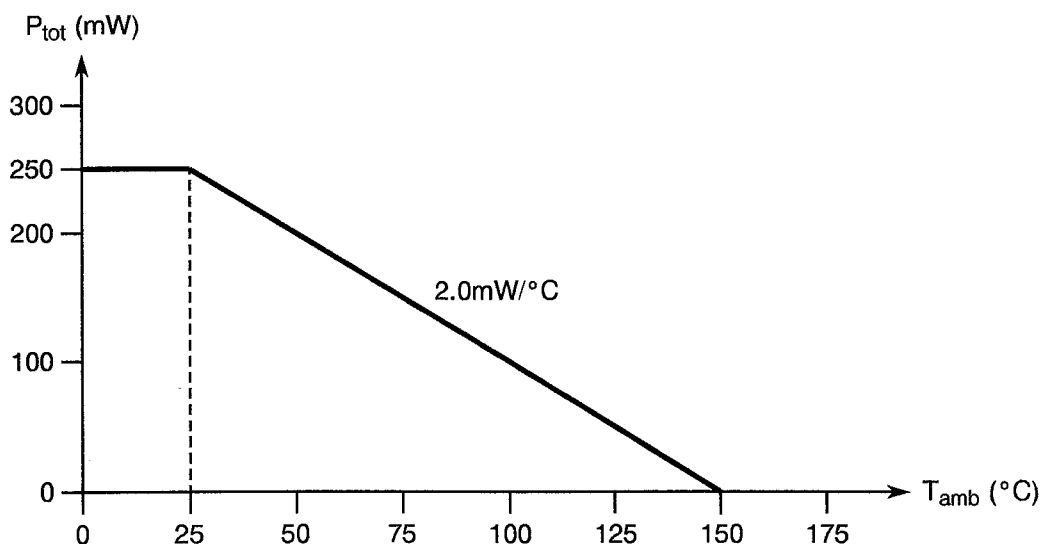
**TABLE 1(b) - MAXIMUM RATINGS**

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Reverse Voltage	$V_{RM}$	16	V	-
2	Power Dissipation	$P_{DISS}$	250	mW	Note 1
3	Operating Temperature Range	$T_{op}$	-65 to +150	°C	-
4	Storage Temperature Range	$T_{stg}$	-65 to +200	°C	-
5	Soldering Temperature	$T_{sol}$	+230	°C	Note 2

**NOTES**

- At  $T_{amb} \leq +25^{\circ}C$ . For derating at  $T_{amb} > +25^{\circ}C$ , see Figure 1.
- Duration 5 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

**FIGURE 1 - PARAMETER DERATING INFORMATION**

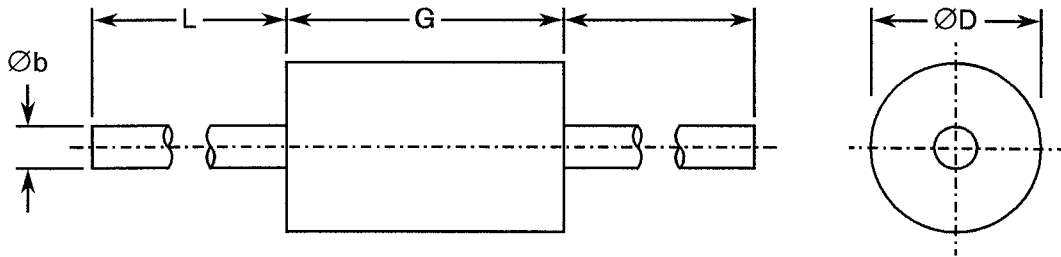


Power Dissipation versus Temperature





**FIGURE 2 - PHYSICAL DIMENSIONS**



SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
G	3.81	4.32	1
ØD	1.73	1.93	1, 2
L	25.40	38.10	
Øb	0.36	0.51	

**NOTES**

1. Includes all components of the diode periphery except the sections of leads over which the diameter is controlled.
2. Measured at the largest diameter.

**FIGURE 3 - FUNCTIONAL DIAGRAM**



1. Anode
2. Cathode

**NOTES**

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



#### 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": Shall not be performed.

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

None.

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

(a) Para. 9.2.2, "Bond Strength": Shall not be performed.

(b) Para. 9.9.3, "Electrical Measurements at Room Temperature" shall be performed in accordance with Table 6 of this specification.

###### 4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.9.3, "Electrical Measurements at Room Temperature" shall be performed in accordance with Table 6 of this specification.

##### 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 0.2 grammes.

##### 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

The case shall be hermetically sealed glass.



4.4.2 Lead Material and Finish

The lead material shall be Type 'C' with Type '2' or Type '3 or 4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking as 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:-

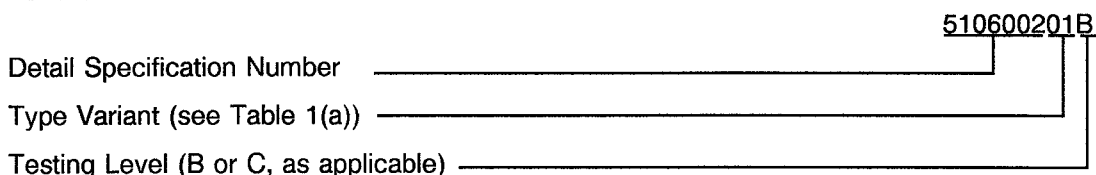
- (a) Lead Identification.
- (b) The SCC Component Number.
- (d) Traceability Information.

4.5.2 Lead Identification

The cathode shall be identified by a painted band.

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.

4.6 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  $T_{amb} = +25 \pm 3 \text{ }^\circ\text{C}$ .

4.6.1.1 Test Method for Effective Carrier Lifetime ( $\tau$ )

This test shall be measured with the device installed in the test fixture, drawing C680001, using the test set up shown in Figure 4(b). Adjust the signal generator to 54MHz and a maximum output in order to obtain a sufficient trigger signal for the oscilloscope. Adjust the sensitivity of the oscilloscope to 20mV/cm. With the device in the the test fixture, adjust the output amplifier until the peak amplitude of the forward current is 20mA or 5.0cm as seen on the oscilloscope. Change sensitivity of scope to 2.0mV/cm. Under these conditions, the effective carrier lifetime is related to the amplitude designated as " $\tau$ " shown on Figure 4(b). This amplitude has the calibration of 50ps/cm.



#### 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  $T_{\text{case}} = +125(+0-5)^\circ\text{C}$  and  $-65(+5-0)^\circ\text{C}$  respectively.

#### 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 and are for reference only.

### 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, measurements shall be performed at  $T_{\text{amb}} = +25 \pm 3^\circ\text{C}$ . The parameter drift values ( $\Delta$ ) 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 High Temperature Reverse Bias Burn-in

The requirements for high temperature reverse bias burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. 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 7 of ESA/SCC Generic Specification No. 5000. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

#### 4.7.4 Electrical Circuits for High Temperature Reverse Bias Burn-in (Figure 5(a))

Not applicable.

#### 4.7.5 Electrical Circuits for Power Burn-in (Figure 5(b))

Not applicable.



**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	Forward Voltage 1	$V_{F1}$	4011	$I_F = 1.0\text{mA}$	-	0.55	V
2	Forward Voltage 2	$V_{F2}$	4011	$I_F = 35\text{mA}$	-	1.0	V
3	Reverse Current	$I_R$	4016	$V_R = 16\text{V}$	-	150	nA
4	Breakdown Voltage	$V_{(BR)}$	4021	$I_R = 10\mu\text{A}$	20	-	V

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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
						MIN.	MAX.	
5	Total Capacitance	C	4021	4(a)	$V_R = 0\text{V}$ $f = 1.0\text{MHz}$ $V_{SIG} = 50\text{mV(p-p)}$	-	1.2	pF
6	Effective Carrier Lifetime	$\tau$	Para. 4.6.1.1 of this spec.	4(b)	-	-	100	pS

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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Forward Voltage 1	$V_{F1}$	4011	$I_F = 1.0\text{mA}$	-	0.55	V
2	Forward Voltage 2	$V_{F2}$	4011	$I_F = 35\text{mA}$	-	1.0	V
3	Reverse Current	$I_R$	4016	$V_R = 16\text{V}$	-	30	$\mu\text{A}$

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

FIGURE 4(a) - CAPACITANCE

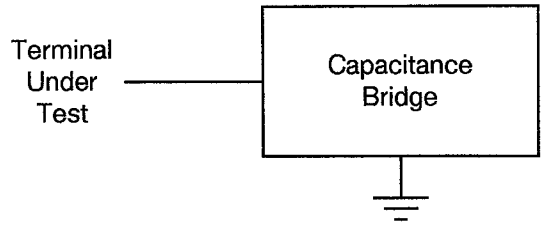
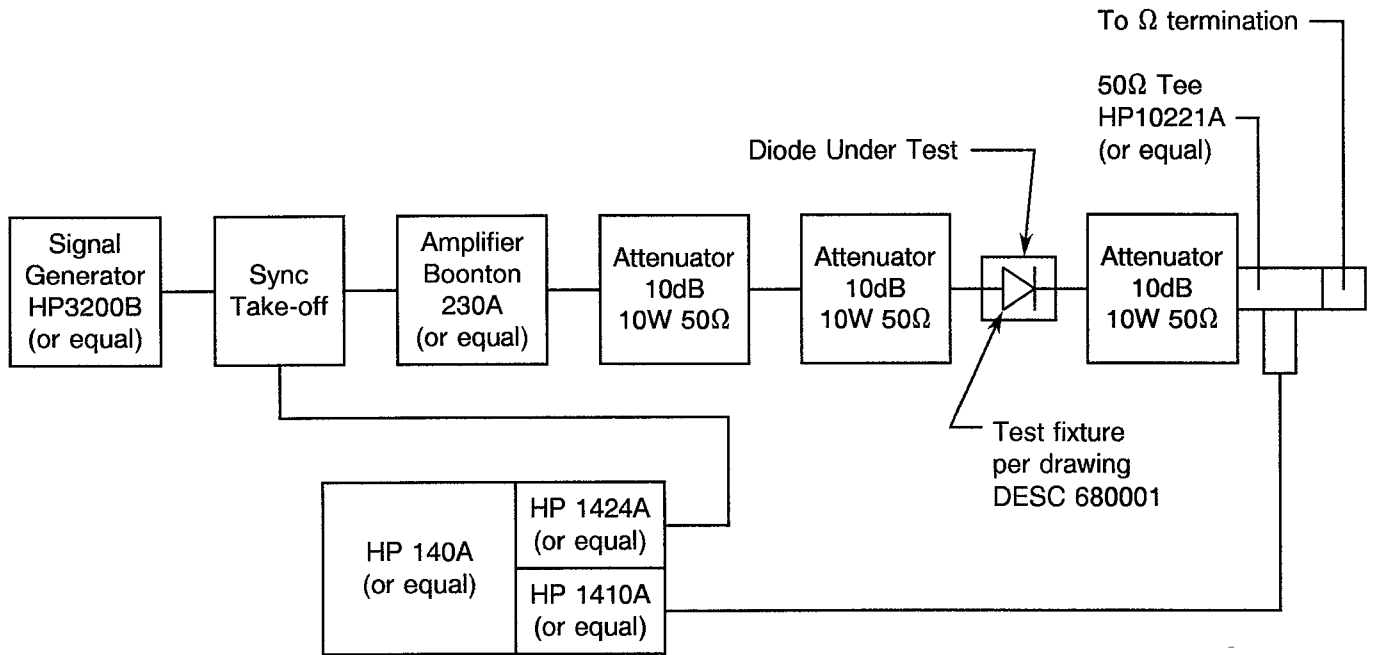
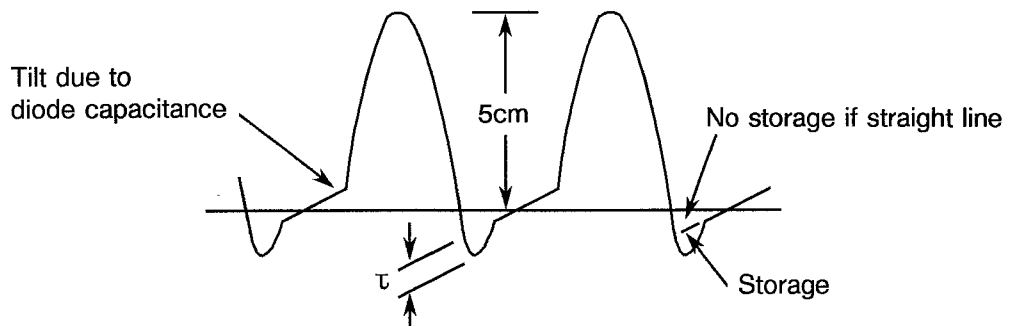


FIGURE 4(b) - EFFECTIVE CARRIER LIFETIME



TEST CIRCUIT



OSCILLOSCOPE DISPLAY FOR MEASUREMENT

**TABLE 4 - PARAMETER DRIFT VALUES**

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS ( $\Delta$ )	UNIT
1	Forward Voltage 1	$V_{F1}$	As per Table 2	As per Table 2	$\pm 55$	mV
3	Reverse Current	$I_R$	As per Table 2	As per Table 2	$\pm 100$ or (1) $\pm 30$	%  nA

**NOTES**

1. Whichever is greater, referred to the initial value.

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	$T_{amb}$	+ 125(+ 0 - 5)	$^{\circ}\text{C}$
2	Reverse Voltage	$V_R$	16	V
3	Duration	t	48	Hrs

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	$T_{amb}$	+ 25(+ 5 - 0)	$^{\circ}\text{C}$
2	Forward Current	$I_F$	33	mA
3	Peak Reverse Voltage	$V_R$	16	Vpk
4	Frequency	f	60	Hz

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

Not applicable.

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

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

**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 as scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = +25 \pm 3 \text{ }^\circ\text{C}$ .

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

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

**4.8.4 Electrical Circuits for Operating Life Tests (Figure 5(b))**

Not applicable.

**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	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Forward Voltage 1	$V_{F1}$	As per Table 2	As per Table 2	-	0.55	V
2	Forward Voltage 2	$V_{F2}$	As per Table 2	As per Table 2	-	1.0	V
3	Reverse Current	$I_R$	As per Table 2	As per Table 2	-	150	nA
4	Breakdown Voltage	$V_{(BR)}$	As per Table 2	As per Table 2	20	-	V
6	Effective Carrier Lifetime	$\tau$	As per Table 2	As per Table 2	-	100	pS