



**DIODES, SWITCHING,  
BASED ON TYPE UTX 4120  
ESCC Detail Specification No. 5103/004**

**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.



europaean space agency  
agence spatiale européenne

Pages 1 to 19

**DIODES, SWITCHING,  
BASED ON TYPE UTX 4120  
ESA/SCC Detail Specification No. 5103/004**



**space components  
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	July 1979		
Revision 'A'	July 1993	<i>Romanus</i>	<i>J. J. ...</i>
Revision 'B'	August 1996	<i>Sam Mitt</i>	<i>A. ...</i>



**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	Jul. '93		<p>This Issue incorporates all modifications agreed on the basis of Policy DCR 21016 for adaptation to new qualification requirements</p> <p>P1. Cover Page  P2. DCN  P4. Table of Contents : "Appendices" title added  P10. Para. 4.1 : Additional text added  Para. 4.2.2 : PIND deviation amended  P15. Table 3 : Note 2 deleted</p>	<p>None  None  21019  21019  21043  21047</p>
			<p>This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.</p>	
'B'	Aug. '96		<p>P1. Cover Page  P2. DCN  P5. Para. 1.7 : Text amended  P6. Table 1(a) : Lead Material column heading amended  : Lead Material and Finish codified  P10. Para. 2 : Item "(c)" deleted and "(d)" renumbered  P12. Para. 4.4.2 : Text rewritten</p>	<p>None  None  21083  21025  21025  21025  21025</p>

## TABLE OF CONTENTS

		<u>Page</u>
1.	<b><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	Functional Diagram	5
1.7	High Temperature Test Precautions	5
2.	<b><u>APPLICABLE DOCUMENTS</u></b>	<b>10</b>
3.	<b><u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u></b>	<b>10</b>
4.	<b><u>REQUIREMENTS</u></b>	<b>10</b>
4.1	General	10
4.2	Deviations from Generic Specification	10
4.2.1	Deviations from Special In-process Controls	10
4.2.2	Deviations from Final Production Tests (Chart II)	10
4.2.3	Deviations from Burn-in Tests (Chart III)	11
4.2.4	Deviations from Qualification Tests (Chart IV)	11
4.2.5	Deviations from Lot Acceptance Tests (Chart V)	11
4.3	Mechanical Requirements	11
4.3.1	Dimension Check	11
4.3.2	Weight	11
4.3.3	Terminal Strength	11
4.4	Materials and Finishes	11
4.4.1	Case	12
4.4.2	Lead Material and Finish	12
4.5	Marking	12
4.5.1	General	12
4.5.2	Lead Identification	12
4.5.3	The SCC Component Number	12
4.5.4	Traceability Information	12
4.5.5	Marking of Small Components	12
4.6	Electrical Measurements	13

**SCC**ESA/SCC Detail Specification  
No. 5103/004

Rev. 'A'

PAGE 4

ISSUE 1

	<u>Page</u>
4.6.1 Electrical Measurements at Room Temperature	13
4.6.2 Electrical Measurements at High and Low Temperatures	13
4.6.3 Circuits for Electrical Measurements	13
4.7 Burn-in Tests	13
4.7.1 Parameter Drift Values	13
4.7.2 Conditions for Burn-in	13
4.7.3 Electrical Circuits for Burn-in	13
4.8 Environmental and Endurance Tests	18
4.8.1 Electrical Measurements on Completion of Environmental Tests	18
4.8.2 Electrical Measurements at Intermediate Points during Endurance Tests	18
4.8.3 Electrical Measurements on Completion of Endurance Tests	18
4.8.4 Conditions for Operating Life Tests (Part of Endurance Testing)	18
4.8.5 Electrical Circuits for Operating Life Tests	18
4.8.6 Conditions for High Temperature Storage Test (Part of Endurance Testing)	18

**TABLES**

1(a) Type Variants	6
1(b) Maximum Ratings	7
2 Electrical Measurements at Room Temperature - d.c. Parameters	14
Electrical Measurements at Room Temperature - a.c. Parameters	14
3 Electrical Measurements at High Temperature	15
4 Parameter Drift Values	15
5 Conditions for Burn-in and Operating Life Tests	17
6 Electrical Measurements at Intermediate Points and on Completion of Endurance Testing	19

**FIGURES**

1 Average Output Rectified Current Derating with Case Temperature	8
2 Physical Dimensions	9
3 Functional Diagram	9
4 Circuits for Electrical Measurement - Reverse Recovery Time	16

**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 UTX 4120.

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 scheduled in Table 1(b).

**1.4 PARAMETER DERATING INFORMATION**

The applicable derating information for 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 a 100% inert atmosphere.

**SCC**ESA/SCC Detail Specification  
No. 5103/004

Rev. 'B'

PAGE 6

ISSUE 1

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

VARIANT	BASED ON TYPE	LEAD MATERIAL AND FINISH
01	UTX 4120	O1
02	UTX 4120	A4



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

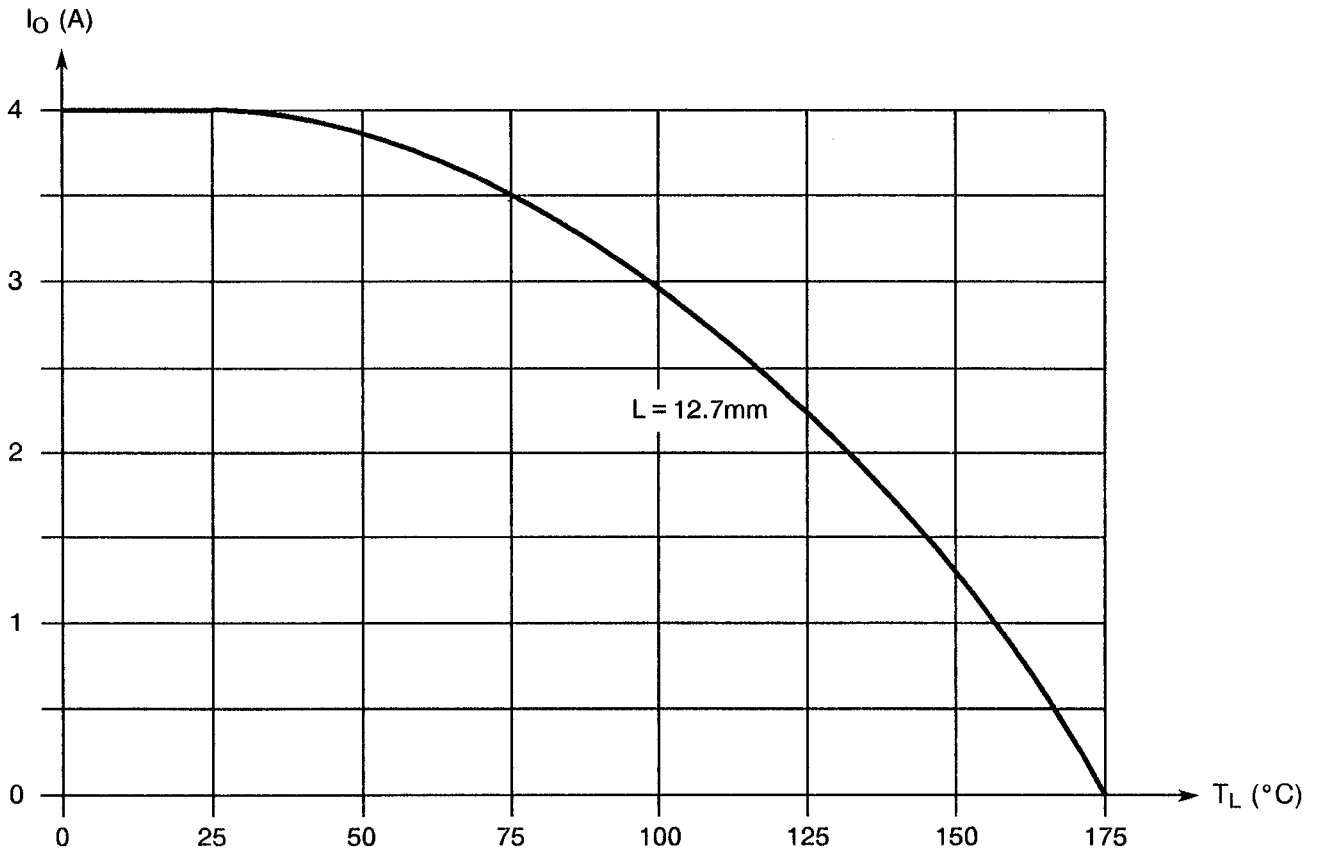
No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Reverse Voltage	$V_R$	200	V	
2	Non-repetitive Peak Surge Current	$I_{FSM}$	80	A	Note 1
3	Average Rectified Forward Current	$I_O$	4.0	A	Note 2
4	Operating Temperature	$T_{op}$	+ 175	°C	
5	Storage Temperature	$T_{stg}$	+ 175	°C	
6	Soldering Temperature	$T_{sol}$	+ 245	°C	Note 3

**NOTES**

1. Sinusoidal, with period = 8.3ms maximum.
2. For derating of  $I_O$  with  $T_L$ , see Figure 1.
3. Duration 10 seconds maximum at a distance of not less than 1.5mm from the can and the same lead shall not be resoldered until 3 minutes have elapsed.



**FIGURE 1 - AVERAGE OUTPUT RECTIFIED CURRENT DERATING WITH TEMPERATURE**

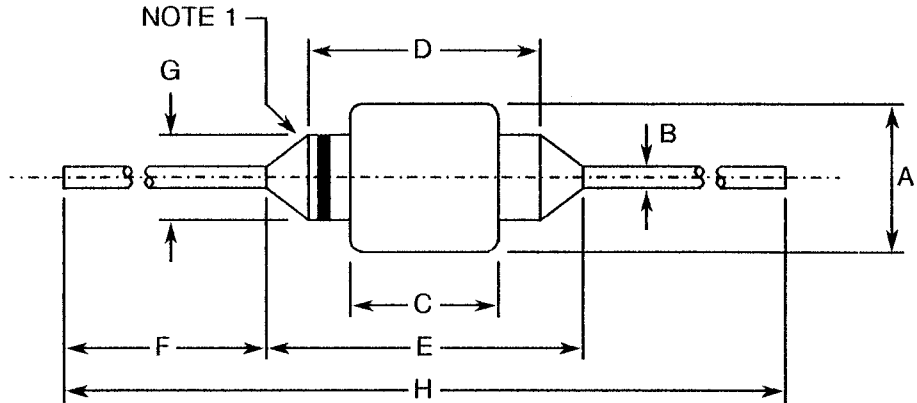


**NOTES**

1. L = Lead length from body to mounting unit.



**FIGURE 2 - PHYSICAL DIMENSIONS**



SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	-	0.145	-	3.70	
B	0.039	0.041	0.99	1.05	
C	0.088	0.110	2.24	2.79	
D	0.153	0.180	3.89	4.57	
E	-	0.300	-	7.60	
F	0.975	-	24.80	-	
G	0.090	0.120	2.29	3.05	
H	2.300	-	58.40	-	

**FIGURE 3 - FUNCTIONAL DIAGRAM**



- 1. Anode.
- 2. Cathode.

**NOTES**

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

**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-105, Sampling Procedures and Tables for Inspection by Attributes.

**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. In addition, the following abbreviation is used:-

$C_J$  = Junction Capacitance.

**4. REQUIREMENTS****4.1 GENERAL**

The complete requirements for procurement of the diodes specified herein shall be as 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)**

Para. 9.2.1, "Bond Strength Test": Shall not be performed.

Para. 9.7, Particle Impact Noise Detection (PIND) test: Not applicable.

The following test shall be added after Para. 9.8.2, "Seal Test Fine", and before Para. 9.9.3, "Electrical Measurements at Room Temperature":-



Surge Current in accordance with Test Method 4066 of MIL-STD-750. The following test conditions shall apply:-

$T_{amb}$  = + 25 ± 3°C.  
 $I_{FSM}$  = 80A.  
Number of pulses = 5.  
Pulse Rate = 1 pulse/minute.  
 $t_p$  = 8.3ms, Sinusoidal Pulse Form.  
 $V_R$  = 200V.

4.2.3 Deviations from Burn-in Tests (Chart III)

Para. 7.1.1(a), H.T.R.B. Test: Shall not be performed.

4.2.4 Deviations from Qualification Tests (Chart IV)

The Bond Strength Test (Subgroup III) 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 0.75 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: 22.2 Newtons (5 Pounds).  
Duration: 15 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

The case shall be hermetically sealed and have a glass body.

4.4.2 Lead Material and Finish

The lead material shall be either Type 'A' with Type '4' finish or Type 'O' with Type '1' 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 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:-

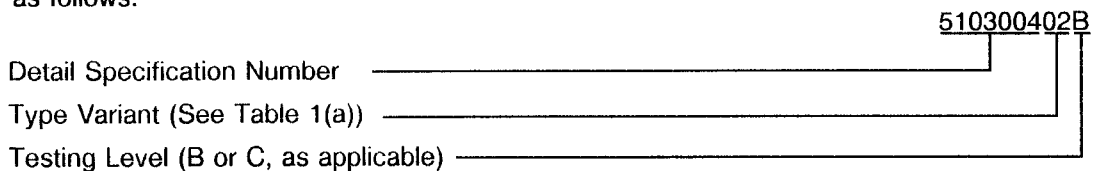
- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

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 are shown, where applicable, in MIL-STD-750 and 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, measurements shall be performed at  $T_{amb} = +22 \pm 3$  °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 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

Not applicable.

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	$I_R$	4016	$V_R = 200V$	-	5.0	$\mu A$
2	Forward Voltage (Note 1)	$V_F$	4011	$I_F = 3.0A$	-	1.0	V
3	Reverse Voltage	$V_R$	4021	$I_R = 100\mu A$	220	-	V

**NOTES**

- Forward voltage limit applies after current is applied for at least 1 second.


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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
4	Junction Capacitance	$C_J$	4001	$V_R = 0V$ $f = 1.0MHz$	-	320	pF
5	Reverse Recovery Time (Note 1)	$t_{rr1}$	4031	$I_F = 1.0A$ $I_R = 1.0A$ $I_{RR} = 0.5A$	-	100	ns
6	Reverse Recovery Time (Note 1)	$t_{rr2}$	4031	$I_F = 1.0A$ $I_R = 1.0A$ $I_{RR} = 0.1A$	-	200	ns

**NOTES**

- Test Circuit Figure 4.



 <b>SCC</b>	ESA/SCC Detail Specification No. 5103/004	Rev. 'A'	PAGE 15 ISSUE 1
---	--	----------	--------------------

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (NOTE 1)**

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	$I_R$	4016	$V_R = 200V$ $T_{amb} = +100(+0 - 5)^{\circ}C$	-	75	$\mu A$

**NOTES**

1. Measurement at low temperature: Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

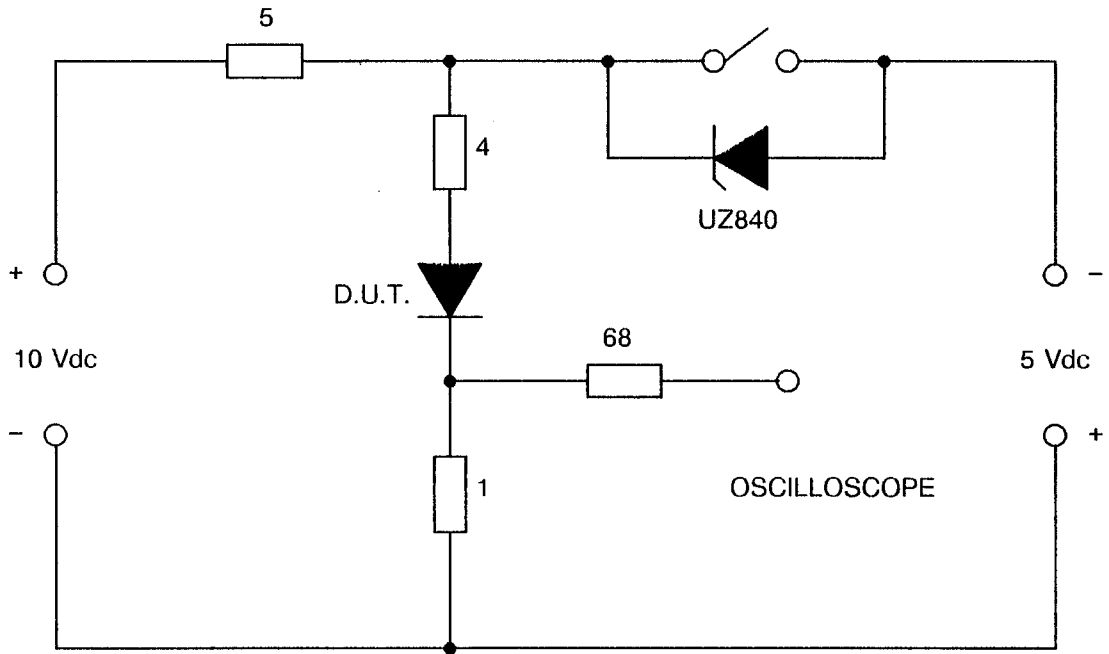
No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMIT ( $\Delta$ )	UNIT
1	Reverse Current	$I_R$	As per Table 2	As per Table 2	$\pm 100$ or (1) 1.0	% $\mu A$
2	Forward Voltage	$V_F$	As per Table 2	As per Table 2	$\pm 100$	mV

**NOTES**

1. Whichever is greater in respect of the initial value.



**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENT - REVERSE RECOVERY TIME**



**NOTES**

1. All resistance values are nominal and in Ohms.

**TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TEST**

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	$T_{amb}$	+ 100(+ 0 - 3)	°C
2	Working Voltage	$V_R$	135	$V_{RMS}$
3	Frequency	f	50 or 60	Hz
4	Average Output Rectified Current	$I_o$	3.0 (Note 1)	A
5	Test Method 1038 of MIL-STD-750	-	A	-
6	Duration	-	168	Hrs

**NOTES**

1. Mounting shall be performed without bending or soldering the leads. Lead length from body to mounting point shall be 0.5 inch (12.7mm).



#### 4.8 ENVIRONMENTAL AND ENDURANCE TESTS

##### 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 during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6.

##### 4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured on completion of endurance tests are scheduled in Table 6. The measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C.

##### 4.8.4 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 of this specification.

##### 4.8.5 Electrical Circuits for Operating Life Tests

Not applicable.

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

The requirements for the high temperature storage test are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for high temperature storage test shall be  $T_{amb} = +175(+0 - 5)$ °C.

**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	$I_R$	As per Table 2	As per Table 2	-	5.0	$\mu A$
2	Forward Voltage	$V_F$	As per Table 2	As per Table 2	-	1.0	V
5	Reverse Recovery Time	$t_{rr1}$	As per Table 2	As per Table 2	-	100	ns