DIODES, MICROWAVE, SILICON,

MULTIPLIER VARACTOR,

BASED ON TYPES DH252, DH256, DH267

AND DH292

ESCC Detail Specification No. 5512/016

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space components
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		P9. Para. 4.2.4	: New Deviations (a) to (c) added and existing Deviations renumbered as (d) and (e)	221415
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		Para. 4.3.2	: Moved to Page 10	None
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		P2. DCN		None
		P4. T of C	: Table 5(b) amended	221575
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		Para. 4.2.5	: New Deviation (d) added and existing Deviation renumbered (e)	221575
		P11. Para. 4.7	: Text amended to read, 'Category 2'	221575
		Para. 4.7.2	: Text amended to read, 'Section 9'	221575
		Para. 4.7.3	: Text amended to read, 'Section 9'	221575
		P15. Table 5(b)	: Title amended to include, 'AND OPERATING LIFE TESTS'	221575
		Table 5(c)	: Table deleted	221575
		P17. Para. 4.8.4	: In second sentence, 5(c) renumbered to 5(b)	221575

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APPENDICES (Applicable to specific Manufacturers only)

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Diode, Microwave, Silicon, Multiplier Varactor, based on Types DH252, DH256, DH267 and DH292. It shall be read in conjunction with ESA/SCC Generic Specification No. 5010, the requirements of which are supplemented herein.

1.2 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 2 with a Minimum Critical Path Failure Voltage of 1550V.

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. 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 ESA/SCC Basic Specification No. 21300 shall apply. In addition the following symbols are used:

C_T = Total Capacitance.

t_{SO} = Snap off Time.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) FIGURE	(4) TOTAL CAPACITANCE C_T (pF) (Note 1)		(5) OUTPUT POWER $P_{out(W)}$	(6) OUTPUT FREQUENCY f_0 (GHz)	(7) BODY-LID AND LEAD MATERIAL AND FINISH
			MIN	MAX			
01	DH252	2	1.1	2.2	3.0	2.0 - 8.0	A7 - D7
02	DH256	2	0.7	1.3	2.0	5.0 - 12	A7 - D7
03	DH292	2	0.4	0.7	0.6	8.0 - 16	A7 - D7
04	DH267	2	0.4	0.5	0.2	10 - 25	A7 - D7

NOTES

1. V_R = - 6.0V, f = 1.0MHz.

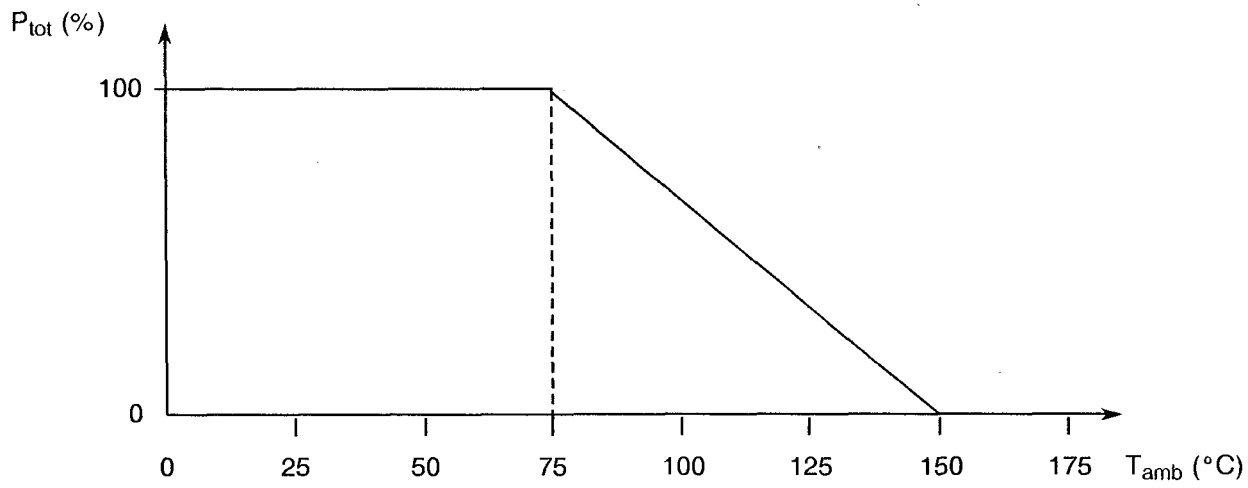
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	D.C. Reverse Voltage Variant 01 Variant 02 Variant 03 Variant 04	V_R	 −40 −30 −20 −15	V	
2	D.C. Forward Current (Continuous) Variants 01 and 02 Variants 03 and 04	I_F	 200 100	mA	
3	R.F. Power Dissipation Variant 01 Variant 02 Variant 03 Variant 04	P_{tot}	 1.5 1.25 1.1 0.75	W	Note 1
4	Operating Temperature Range	T_{op}	−55 to +150	°C	T_{case}
5	Storage Temperature Range	T_{stg}	−65 to +175	°C	
6	Soldering Temperature	T_{sol}	+220	°C	Note 2

NOTES

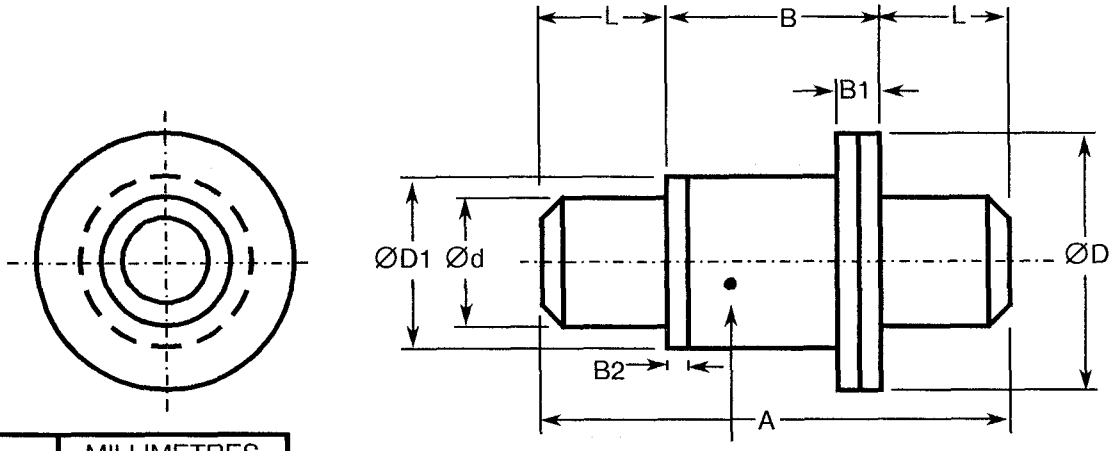
1. At T_{amb} = +75°C. For derating at T_{amb} > +75°C, see Figure 1.
2. Duration 5 seconds maximum and the same termination shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



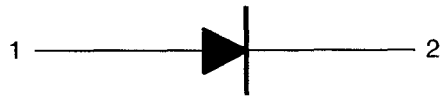
Power Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES	
	MIN	MAX
A	5.20	5.72
B	2.16	2.46
B1	0.41	0.61
B2	0.15	0.25
Ød	1.52	1.63
ØD	3.00	3.23
ØD1	1.95	2.11
L	1.52	1.63

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

NOTES

1. The cathode end shall be marked with a black dot. The marking will not be on the cathode connection but adjacent to it.

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. 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 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

(a) Para. 5.3, Wafer Lot Acceptance: S.E.M. inspection shall be performed on three dies, after die separation.

(b) Para. 5.3, Wafer Lot Acceptance: Minority Carrier Lifetime and Snap off Time measurements shall be performed on 10 devices assembled in standard case.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 9.12, Radiographic inspection: Shall be performed after PIND test.

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

(a) Para. 9.12, Radiographic inspection: Shall be performed in Chart II.

4.2.4 Deviations from Qualification Tests (Chart IV)

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

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

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

(d) Para. 9.19, Terminal Strength: Shall not be performed.

(e) 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: Shall not be performed.

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

(d) Para. 9.19, Terminal Strength: Shall not be performed.

(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 0.15g.

4.3.3 Terminal Strength

Not applicable.

4.3.4 Bond Strength

The requirements for bond strength are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The test conditions shall be as follows:

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

(b) Separating Force: 0.03N minimum.

4.3.5 High Temperature Stabilisation Bake

The requirements for high temperature stabilisation bake are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The temperature to be applied shall be + 175(+0 - 3)°C.

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

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

4.4.2 Lead Materials and Finish

The body material shall be Type 'A' with Type '7' finish and the lid material shall be Type 'D' with Type '7' finish, in accordance with the requirements of ESA/SCC 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 ESA/SCC 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) Cathode Identification.

(b) The SCC 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 The SCC Component Number

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

551201601BF

Detail Specification Number
Type Variant (see Table 1(a))
Testing Level (B or C, as applicable)
Total Dose Irradiation Level (if applicable)

The Total Dose Irradiation Level designation shall be added for those devices for which a sample has been successfully tested to the level in question. For these devices, a code letter shall be added in accordance with the requirements of ESA/SCC Basic Specification No. 22900.

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information as defined in 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 $T_{amb} = +22 \pm 3$ °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. Unless otherwise specified, the measurements shall be performed at $+150(+0-3)$ °C.

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 2 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 $T_{amb} = +22 \pm 3$ °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 9 of ESA/SCC 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 ESA/SCC 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 Circuits for High Temperature Reverse Bias and Power Burn-in

Circuits for use in performing the H.T.R.B and power burn-in tests are shown in Figures 5(a) and 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	Breakdown Voltage	V_{BR}	4021	I_R = 10µA Variant 01 Variant 02 Variant 03 Variant 04	 -40 -30 -20 -15	 - - - -	V
2	Reverse Current	I_R	4016	V_R = -10V	-	20	nA
3	Forward Voltage	V_F	4011	I_F = 10mA	-	0.9	V
4 to 5	Thermal Resistance	$R_{TH(J-C)}$	3101	P = 1.0W Variant 01 Variant 02 P = 0.25W Variant 03 Variant 04	 - - - -	 50 60 70 100	°C/W

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.	
6	Total Capacitance	C_T	4001	-	V_R = −6.0V f = 1.0MHz	Note 1		pF
7	Minority Carrier Lifetime	τ_L	-	4(a)	I_F = 10mA I_R = 6.0mA Variant 01 Variant 02 Variant 03 Variant 04	 35 20 10 6.0	 - - - -	ns
8	Snap Off Time	t_{SO}	-	4(b)	I_F = 10mA V_R = 10V/50Ω Variant 01 Variant 02 Variant 03 Variant 04	 - - - -	 200 120 75 60	ps

NOTES

1. See Table 1(a), column (4).

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	I_R	4016	V_R = -10V	-	1.0	µA

TABLE 4 - PARAMETER DRIFT VALUES

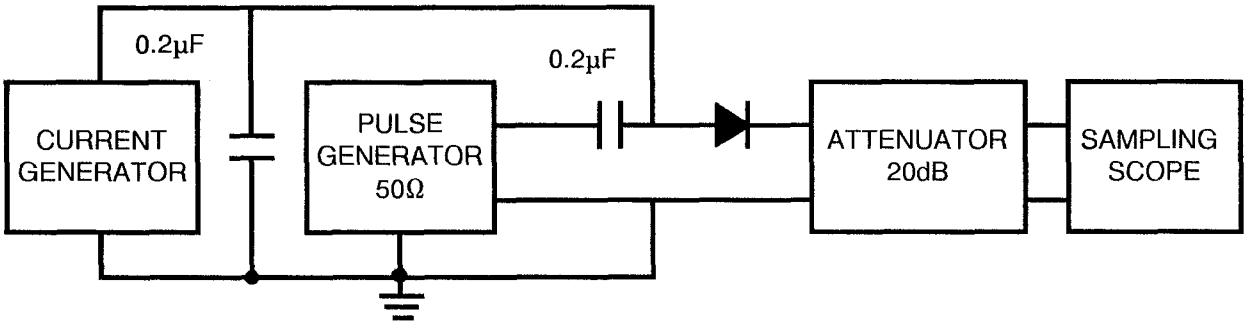
No.	CHARACTERISTICS	SYMBOL	SPEC.AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
2	Reverse Current	I_R	As per Table 2	As per Table 2	±5.0 (1) or (2) ±100 (1)	nA %
3	Forward Voltage	V_F	As per Table 2	As per Table 2	±5.0 (1)	%
6	Total Capacitance	C_T	As per Table 2	As per Table 2	±5.0 (1) (3)	%

NOTES

1. Δ1 = Δ2 = Δ3.
2. Whichever is the greater, referred to the initial measurement.
3. Rounded upwards to nearest 0.01pF value.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - CIRCUIT FOR MEASUREMENT OF MINORITY CARRIER LIFETIME



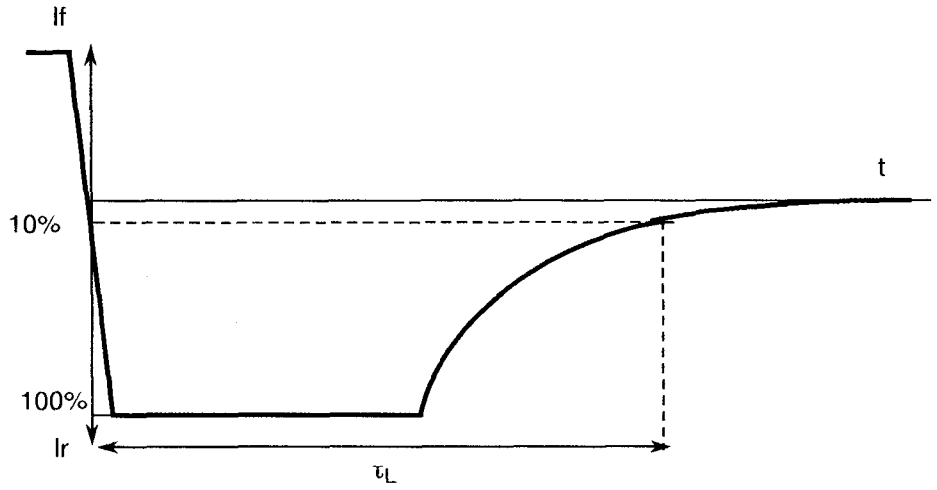
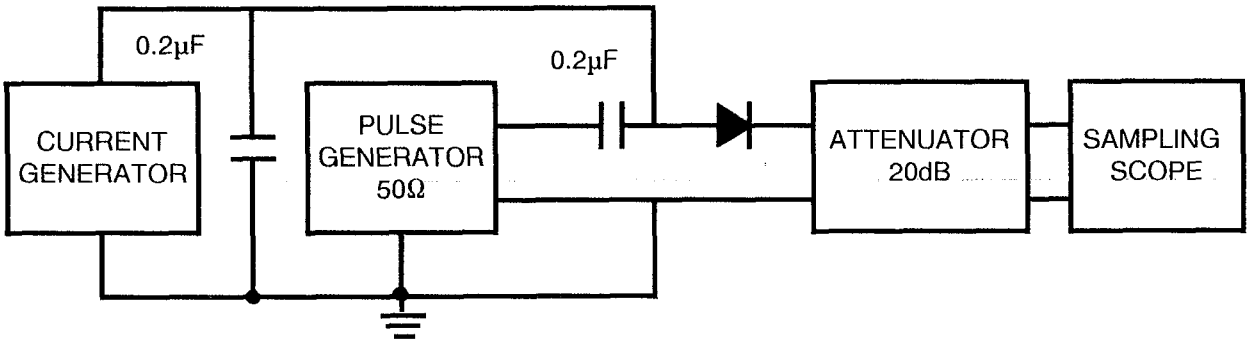


FIGURE 4(b) - CIRCUIT FOR MEASUREMENT OF SNAP-OFF TIME



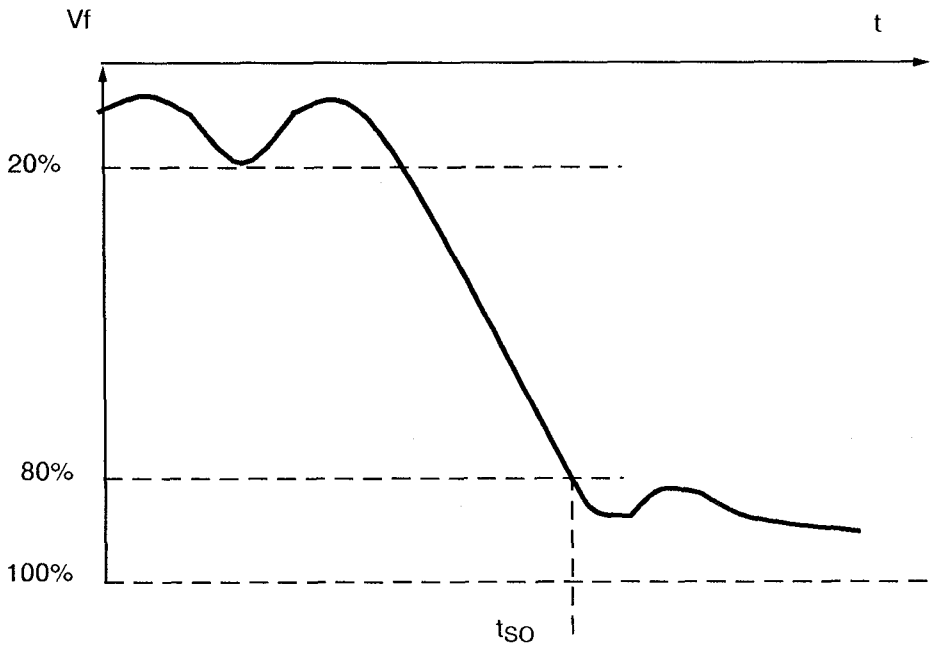


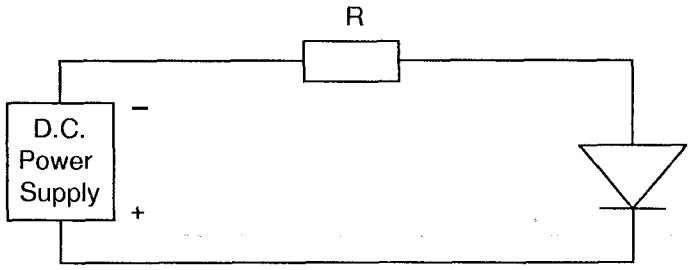
TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+150(+0−3)	°C
2	Reverse Voltage	V_R	Variant 01: -30 Variant 02: -22 Variant 03: -15 Variant 04: -12	V

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C
2	Forward Current	I_F	Variants 01 and 02: 100 Variants 03 and 04: 50	mA

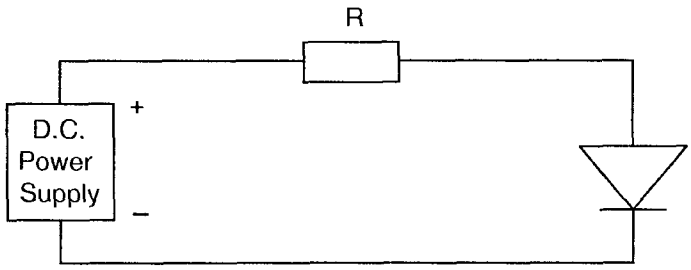
FIGURE 5(a) - ELECTRICAL CIRCUIT FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN



NOTES

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

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



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC 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 $T_{amb} = +22 \pm 3$ °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 tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °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 ESA/SCC 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	Breakdown Voltage	V_{BR}	As per Table 2	As per Table 2	As per Table 2		V
2	Reverse Current	I_R	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
6	Total Capacitance	C_T	As per Table 2	As per Table 2	As per Table 2		pF