DIODES, SWITCHING,

BASED ON TYPE 1N3600

ESCC Detail Specification No. 5101/007

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ESA/SCC Detail Specification No. 5101/007

space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
Issue 2	February 1992		
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in the following DCR's:-		
		Cover Page		None
		DCN		None
		Table of Contents	: After Figures, Appendices heading added	21019
		Para. 1.2	: New text	21021
		Para. 1.3	: Table reference amended to "1(b)"	23476
		Para. 1.4	: Text standardised	23476
		Table 1(a)	: New Table added	21021
		Table 1	: Title amended to "1(b)"	23476
			: Nos. 7 and 9, symbol corrected	23476
		Figure 2	: Imperial dimensions and subsequent Note 1 deleted; other Notes renumbered	None
		Para. 2	: Reference to 'MIL-STD-1276' replaced by 'ESA/SCC Basic Specification No. 23500'	21025
		Para. 4.1	: Second paragraph added	21019
		Para. 4.2.1	: Title corrected	23476
		Para. 4.2.2	: PIND deviation entry standardised	21043
		Para. 4.2.3	: Radiographic Inspection entry standardised	21049
			: H.T.R.B. entry deleted	23499
		Para. 4.2.4	: Title corrected	23476
		Para. 4.4.2	: Text standardised	23476
		Para. 4.5.3	: 'Type Variant' added	21021
		Para. 4.7.1	: Third sentence standardised	23476
		Para. 4.7.2	: Title and text standardised to include 'H.T.R.B. and Power'	23476
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		Para. 4.7.4	: Para. deleted	23476
		Table 2 D.C.	: Format, sequence and Note standardised	23476
		Table 2 A.C.	: Title, format and Note standardised	23476
		Table 3	: Format standardised	23476
		Figure 4	: Entry added	23476
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			: Limits standardised	None
		Table 5	: Title deleted	23476
			: First Table numbered "5(b)" and Title corrected	23476
			: Second Table standardised and numbered "5(a)"; Title corrected, Note corrected and attached to this Table	23476
			: Tables reversed in sequence	23476
		Figure 5	: First Title numbered "5(b)" and corrected	23476
			: Second Title numbered "5(a)" and corrected	23476
			: Figure Titles reversed in sequence	23476
		Para. 4.8.1	: Second sentence standardised	23476
		Para. 4.8.2	: Second sentence added	23476
		Para. 4.8.3	: Table reference amended to "5(b)"	23476
		Para. 4.8.4	: Figure reference amended to "5(b)"	23476
		Para. 4.8.5	: Table reference amended to "1(b)"	23476
		Table 6	: Format and numbering standardised	23476

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	June'94	P1. Cover page P2A DCN P12. Table 2	 : Page added : Max. limit of I_R changed to 0.1μA	None None 221167
'B'	Nov. '95	P1. Cover page P2A. DCN P3. T of C P5. Para. 1.7	 : New Para. 1.7 entry added : New Para. 1.7 entry added	None None 21083 21083

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TABLES

FIGURES

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 Switching Diodes, based on Type 1N3600. 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 parameter 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.

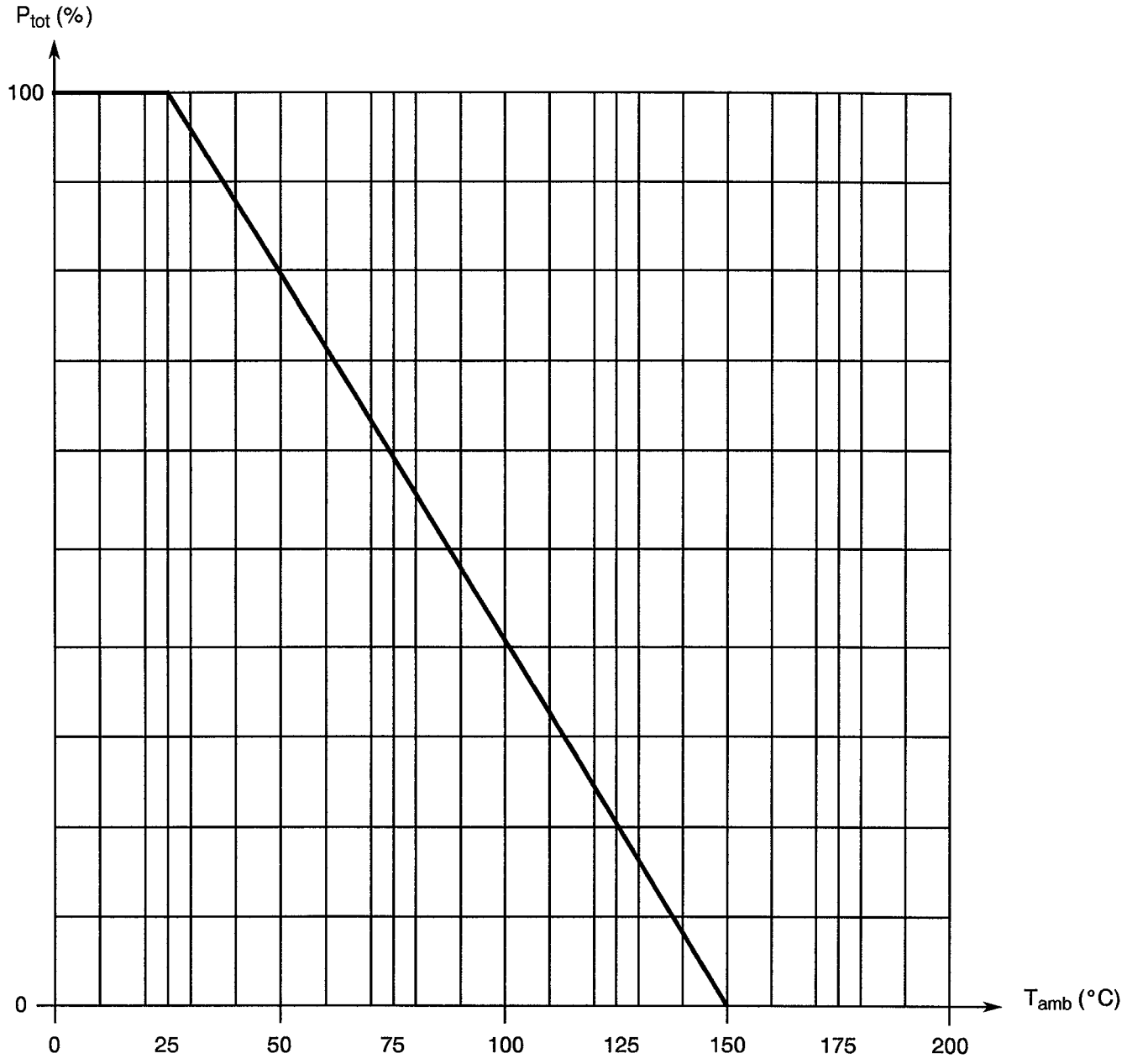
TABLE 1(a) - TYPE VARIANTS

VARIANT	BASED ON TYPE
01	1N3600

TABLE 1(b) - MAXIMUM RATINGS

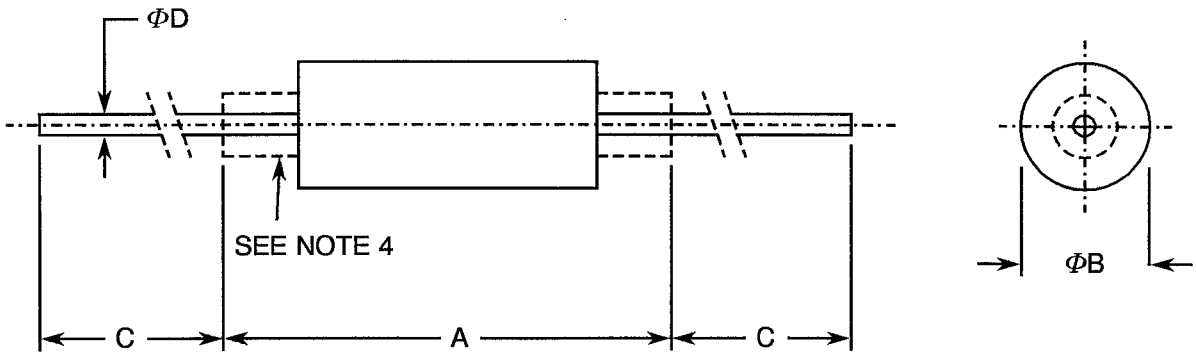
No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	DC Reverse Voltage	V_R	75	V	-
2	Total Power Dissipation	P_{tot}	500	mW	-
3	Average Rectified Current	I_O	200	mA	-
4	DC Forward Current	I_F	400	mA	-
5	Peak Forward Current (Recurrent)	I_{FM}	900	mA	-
6	Forward Surge Current	I_{FSM}	500	mA	$t_p = 1.0s$
			4.0	A	$t_p = 1.0\mu s$
7	Operating Temperature Range	T_{op}	−55 to +150	°C	-
8	Storage Temperature Range	T_{stg}	−65 to +175	°C	-
9	Soldering Temperature	T_{sol}	+260	°C	Time: <10s; Distance to case: >1.5mm

FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

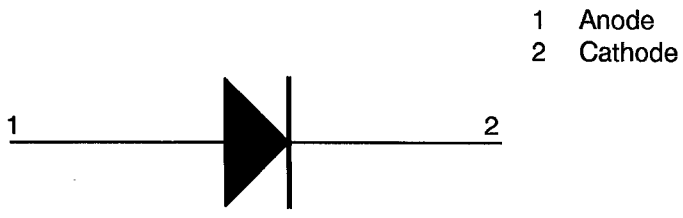


SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
A	4.96	7.62	-
B	1.98	2.72	2, 3
C	25.40	38.10	1
D	0.46	0.56	5

NOTES

1. Both leads shall be within the specified limits (see Para. 3.3.1).
2. The maximum diameter of dimension B shall apply for dimension A.
3. The minimum diameter of dimension B shall apply over at least 1.91mm of dimension A.
4. Ferrule is optional for dimension A.
5. The specified lead diameter applies in the zone between 1.27mm and 25.4mm from the diode body to the end of the lead. Outside of this zone, the lead diameter shall not exceed diameter B.

FIGURE 3 - FUNCTIONAL DIAGRAM



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) ESA/SCC Basic Specification No. 23500, Requirements for Lead Materials and Finishes for Space Application.

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 Detail 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: Shall not be performed.

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

(c) Para. 9.5.1, Thermal Shock Test: Shall be performed in accordance with Test Method 107, Condition 'B' of MIL-STD-202.

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

(a) Para. 9.12, Radiographic Inspection: Not applicable.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.3, Bond Strength Test: 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' 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:

5101007 01 B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information as defined in ESA/SCC Basic Specification No. 21700.

4.5.5 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 electrical measurements listed in Tables 2 and 3 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, 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 H.T.R.B. and Power Burn-in

The requirements for H.T.R.B. and Power Burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for H.T.R.B. and Power Burn-in shall be as specified in Tables 5(a) and 5(b) of this specification.

4.7.3 Electrical Circuits for H.T.R.B. 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	DC Forward Voltage 1	V_{F1}	4011	$I_F = 10mA$	0.66	0.74	V
2	DC Forward Voltage 2	V_{F2}	4011	$I_F = 50mA$ (1)	0.77	0.86	V
3	DC Forward Voltage 3	V_{F3}	4011	$I_F = 200mA$ (1)	0.87	1.0	V
4	DC Reverse Current	I_R	4016	$V_R = 50V$	-	0.1	µA
5	Breakdown voltage	V_{BR}	4021	$I_R = 5.0µA$	75	-	V

NOTES

1. Pulsed operation, $t_p = 300µs$; $\delta > 2\%$.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
5	Capacitance	C	4001	$V_R = 0$ f = 1.0MHz Note 1	-	2.5	pF
6	Reverse Current Recovery Time	t_{rr}	4031, Condition 'B'	$I_F = I_R = 10\text{-}200mA$ $R_L = 100\Omega$ $i_{rr} = 0.1\ I_F$	-	4.0	ns

NOTES

1. Measurements shall be performed on a sample basis, Inspection Level 2, AQL = 2.5%.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
4	DC Reverse Current	I_R	4016	T_{amb} = +150°C V_R = 50V	-	100	µA

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS	UNIT
3	DC Forward Voltage 3	V_{F3}	As per Table 2	As per Table 2	±100	mV
4	DC Reverse Current	I_R	As per Table 2	As per Table 2	±100 or (1) ±100	% nA

NOTES

1. Whichever is the greater.

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

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+150 (Note 1)	°C
2	Reverse Voltage	V_R	50	V
3	Duration	t	72	Hrs

NOTES

1. At the end of the H.T.R.B. Burn-in, 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 TEST

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Working Voltage	V_{WK}	50V(PK)	V
2	Average Rectified Current	I_O	200	mA
3	Frequency	f	50 to 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 TEST

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. 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. 5000. The conditions for operating life testing shall be the same as specified in Table 5(b) 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 tests shall be the same as shown in Figure 5(b) 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 TESTS

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
3	DC Forward Voltage 3	V_{F3}	As per Table 2	As per Table 2	0.85	1.05	V
4	DC Reverse Current	I_R	As per Table 2	As per Table 2	-	0.20	µA